DRAFT ENVIRONMENTAL IMPACT REPORT

KINGSTON BEDFORD ESSEX STREET DEVELOPMENT

EOEA NO. 6132

City Of Boston
Raymond L. Flynn
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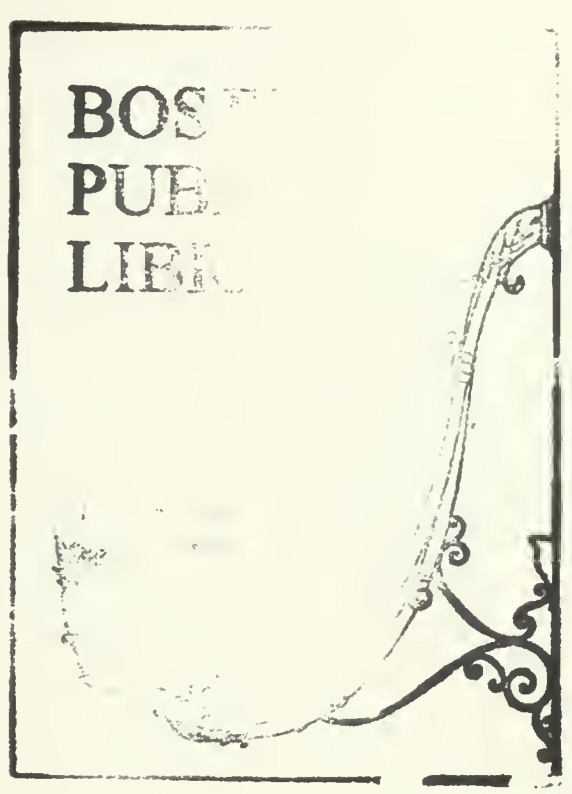
March 1989



KINGSTON-BEDFORD-ESSEX STREET DEVELOPMENT

EOEA NO. 6132

DRAFT ENVIRONMENTAL

IMPACT REPORT

Chapters I - VII

Technical Appendices A, C, D, & E

Submitted by

BOSTON REDEVELOPMENT AUTHORITY

April 1989

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* Appendix B is published in a separate Appendix Volume and is available for review at the Executive Office of Environmental Affairs - MEPA Unit and at the Boston Public Library. Individual copies of this detailed technical document are available on request from the Boston Redevelopment Authority, (617) 722-4300, extension 4283.

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I. Executive Summary

A. Project Overview

This Draft Environmental Impact Report (DEIR) investigates the impacts associated with several proposed alternatives for the development of the Kingston-Bedford-Essex Street site, located between Chinatown and the Financial District in downtown Boston. The project proponents are the Boston Redevelopment Authority and the developer, the Metropolitan/Columbia Plaza Venture.

The Kingston-Bedford-Essex Street site is one of the few remaining downtown sites which is owned by the City of Boston and is available for development. A parking garage stands on the northern half of the block bounded by Bedford, Kingston, Essex, and Columbia Streets. Another City-owned parcel, at the corner of Essex, Lincoln, and Columbia Streets, currently serves as a parking lot. Three privately-owned parcels also are considered potentially available for development. They include 80 and 88 Kingston Street, adjacent to the Kingston-Bedford garage, and 128 Essex Street, a privately-owned parking lot. Figure I-1 shows the site location and surrounding area.

As proposed, the project, is principally a commercial development. Preliminary plans call for a mix of office space, retail shops, parking, and a network of attractive public spaces and pedestrian walkways that provide easy access to buildings in the Financial District and Chinatown. Several alternatives also consider the development of a hotel. Six alternatives are examined in this DEIR, including a no build alternative which continues the existing uses of the site and five build options offering a range of development scenarios. In three of the build alternatives, only the publicly-owned property is developed. In the two other build alternatives all the above-mentioned parcels are developed.

B. Environmental Review Process

Because the Kingston-Bedford-Essex Street project is considered a major development, the Massachusetts Executive Office of Environmental Affairs (EOEA) has determined that the project requires the preparation of an Environmental Impact Report in accordance with the Massachusetts Environmental Policy Act (MEPA) and its implementing regulations (301 CMR 11.00).

The alternatives and the categories of impacts to be studied, such as traffic generation, demands on utilities, and construction management, were defined by the EOEA in response to a filing of an Environmental Notification Form (ENF) by the Boston Redevelopment Authority (BRA). The Executive Office of Environmental Affairs requested that the BRA study four alternatives for development of the site. In response to community suggestions for lower building height and greater site coverage, a fifth alternative was adopted during the EIR scoping process. Subsequent to EOEA's scoping, Metropolitan/Columbia Plaza Venture was selected as the project developer and submitted a sixth alternative, which is also included in this report.

The Draft Environmental Impact Report presents the environmental and socioeconomic consequences associated with implementation of each alternative. No preference for a particular alternative is presented in this DEIR in order to allow the review process to evaluate alternatives on an equal basis. This report will serve as an information source for planners, citizens, and developers to use in weighing the beneficial and adverse effects of preliminary designs and in evaluating whether individual elements, when aggregated, satisfy project objectives and the needs of the community.

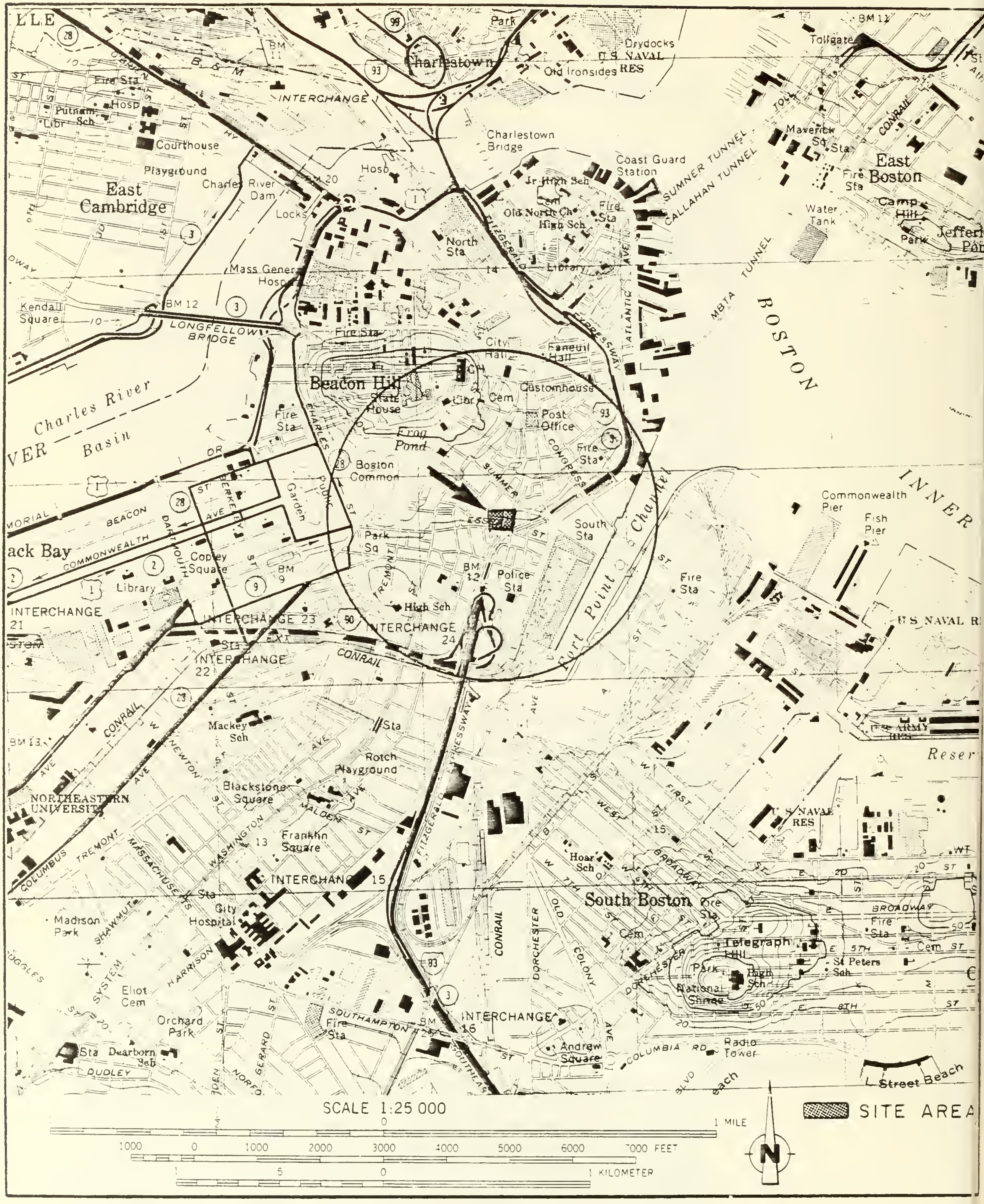


Figure I-1:
Kingston-Bedford-Essex Street Site Location Map

Following submittal of the DEIR and review by the community and the Executive Office of Environmental Affairs, a preferred alternative will be selected with the full knowledge of the environmental impacts and socio-economic considerations. Mitigation measures and recommendations resulting from this review will become input for the actual design of the project.

Metropolitan/Columbia Plaza Venture will prepare a Final Environmental Impact Report which will present a single preferred proposal that incorporates the findings of this DEIR, comments from the community and public agencies, and recommendations by the Executive Office of Environmental Affairs.

C. Project Background

Parcel-to-Parcel Linkage

Development of the Kingston-Bedford-Essex Street site is significant because it is Boston's first Parcel-to-Parcel Linkage Project. This project, since its inception, has been linked to the development of Parcel 18 in Roxbury.

In 1985, the Flynn and Dukakis administrations introduced the concept of "Parcel-to-Parcel Linkage" to: (1) spread the benefits of development more evenly throughout Boston; (2) promote neighborhood economic development; and (3) increase opportunities for minorities to benefit from real estate development. The program links the development of valuable, publicly-owned parcels downtown to the development of publicly-owned parcels in disadvantaged neighborhoods. It also requires that community organizations, minority developers, and entrepreneurs become equity partners for the simultaneous development of both parcels.

In June of 1987, the City and State selected Columbia Plaza Associates (CPA) to serve as the minority development partner for both Parcel 18 and the Kingston-Bedford-Essex Street projects. Columbia Plaza Associates is a partnership of Asian-American, Black, and Hispanic entrepreneurs. Each entrepreneurial group in the partnership includes community-based organizations as shareholders.

Columbia Plaza Associates, in turn, selected Metropolitan Structures as its joint venture partner from a field of three nationally prominent developers. CPA holds a fifty percent equity position in the project, exceeding the thirty percent share required by the City.

Community Participation

The Chinatown/South Cove Neighborhood Council and the Parcel 18+ Task Force have worked diligently with the BRA to develop the Parcel-to-Parcel Linkage Program and advise the BRA on all aspects of these projects, including developer selection.

The Chinatown and Roxbury groups formed the Parcel-to-Parcel Linkage Advisory Panel. Also participating in the panel are the BRA, the MBTA, the City of Boston Real Property and Public Facilities Departments, the Governor's Office of Economic Development, the Mayor's Office of Neighborhood Services, and the Mayor's Office of Jobs and Community Services. The panel has established subcommittees on (1) jobs and jobs training; (2) minority business enterprise; and, (3) childcare. The Metropolitan/Columbia Plaza Venture has worked closely with

the Advisory Panel to shape the direction of the two projects and, in particular, to refine a benefits plan for the two communities.

Community Benefits

The community benefits plan is the most wide-ranging in the City's history. When implemented, it will encompass programs to build affordable housing, fund job training programs, stimulate minority business opportunities, and provide child care facilities. The major components of the plan are highlighted below.

Community Development Fund

The Metropolitan/Columbia Plaza Venture will contribute 10 percent of the developer's fee, 5 percent of the net operating income, and 10 percent of the residuals and sales proceeds to a Community Development Fund. Alternatively, a contribution may be made as an up-front lump sum payment or as annual cash distributions in fixed dollar amounts. Funds will be used to leverage local business expansion, affordable housing, social services, and other community-based projects in Chinatown and Roxbury.

Housing Linkage

The City of Boston requires that developers contribute $5 per square foot of commercial development over 100,000 square feet toward the creation of affordable housing. Development of the Kingston-Bedford-Essex Street and the Parcel 18 sites will generate $7.5 million in housing linkage funds to be shared equally by Chinatown and Roxbury.

Jobs and Job Training

The Kingston-Bedford-Essex Street and Parcel 18 projects are expected to generate 4,000 construction jobs. The developer will seek to achieve hiring goals which specify that at least 50 percent of total employee hours of all construction jobs created be held by Boston residents, 30 percent by minorities, and 10 percent by women.

The two projects eventually will support 6,200 permanent jobs and generate $1.5 million in job training linkage funds for residents of Chinatown and Roxbury. Developers are required to contribute to a job-training fund of $1 per square foot for commercial developments over 100,000 square feet. The Metropolitan/Columbia Plaza Venture intends to apply the funds directly to the training of community residents for permanent employment opportunities in the project. In addition, the Venture will join the Boston for Boston Program, a resident hiring program carried out by the Office of Jobs and Community Services, and will encourage project tenants to make best faith efforts to direct new jobs to local residents.

The benefits package also contains three other employment features. First, Metropolitan/Columbia Plaza Venture is offering a $400,000 grant for on-the-job training in real estate development. Second, 30 percent of consultant contracts, estimated at $18.5 million, will be targeted to certified minority- and women-owned businesses. And third, the Venture will seek ways to encourage minority-owned businesses to occupy space at both sites.

Child Care

Child care facilities will be provided for 100 children in Chinatown and 100 children in Roxbury. These facilities may be located on or off the project sites.

Planning Grant

The Metropolitan/Columbia Plaza Venture has pledged $100,000 to the Chinatown Neighborhood Council and the Parcel 18+ Task Force to facilitate greater participation over the next two years in project planning and review.

Overall, the community benefits which will accrue will exceed those proposed for any other project to be built in Boston. While mitigation measures typically seek to redress adverse impacts of a specific development, in the case of these two projects the community benefits will seek to address an even broader set of social concerns -- the economic revitalization and preservation of Boston's minority communities.

D. Environmental Setting

The Kingston-Bedford-Essex Street site lies at the juncture of five important Boston districts: Chinatown to the southwest, the Midtown Cultural District to the west, the Financial District to the immediate northeast, the Commercial Palace District to the north, and the Leather District across the Surface Artery to the southwest. Boston's downtown shopping district, including the Downtown Crossing retail center with its department stores and numerous smaller retail and service stores, is within walking distance of the site. Three hundred feet east of the site is South Station, a major subway, railroad, and bus facility serving the metropolitan and regional area. To the southwest of the project site is the Tufts-New England Medical Center complex on the edge of Chinatown.

The site has excellent road and public transit access. The Central Artery and Massachusetts Turnpike are close at hand, as are the Washington and South Station public transit stations.

The project site is situated on the original Shawmut Peninsula land mass. It is near the Colonial waterfront and was originally a fashionable residential area. Gradually, in the 1830's, the residential dwellings were replaced by granite warehouses, used for storing merchandise and materials. In 1872, a massive fire swept through Boston proper destroying more than 700 buildings, including the warehouses. Construction to replace them began immediately. Most of the new warehouses were five to six stories high, with fronts of granite and mansard roofs.

Today, located on the blocks which include the Kingston-Bedford-Essex Street site are two surface parking lots and four buildings -- the Bedford Building on the northeast, two masonry buildings on Kingston Street, and a nine-story parking garage on the northwest corner built and owned by the City.

E. Development Alternatives

Six alternatives were developed to test the implications of different land uses, building designs, and parcel sizes. The alternatives are:

Alternative 1:	No Build
Alternative 2:	400 ft. Tower
Alternative 3:	325 ft. Tower
Alternative 4:	250 ft. Tower
Alternative 5:	Expanded Site
Alternative 6:	Developer's Proposal

Under the No Build option, the site would remain as is. The key parameters which distinguish the five build alternatives are: (1) the height and location of the major office tower, (2) the number of towers, (3) the square footage of site actually developed, and (4) the final disposition of Columbia and Essex Streets.

Alternatives 2, 3, and 4 include two towers, with varying heights in each alternative. These alternatives also assume that the project would be built on the City-owned parcels exclusively. Columbia Street would remain open and Essex Street would not be widened. Alternatives 5 and 6 assume the widening of Essex Street, the closure of Columbia Street, and the inclusion of the three privately-owned parcels. Alternative 5 includes two towers while the Developer's Proposal, Alternative 6, tests the impact of locating a single, tall tower on the southeastern corner of the site at the corner of Essex and Lincoln Streets.

Figure I-2 and Table I-1 compare the land uses proposed for Alternatives 2 through 6. All of the build alternatives feature a building complex with commercial office space as the predominate use and underground parking for 600 to 900 automobiles. Alternatives 2, 3, 4, and 5 also contain a hotel and small amount of retail space. Alternative 6 features office space, expanded retail space, and an atrium and pedestrian passage.

Figures I-3 through I-8 show the different design concepts and site coverage employed for each alternative.

F. Summary of Environmental Issues

This DEIR addresses specific environmental and socio-economic issues identified by the Massachusetts Executive of Environmental Affairs in the ENF Certificate, dated August 8, 1986 (Appendix A).

All six development alternatives were analyzed and compared, using a baseline year of 1993. The following environmental areas of concern were addressed:

Transportation
Air Quality
Noise
Utilities
Massing and Shadows
Aeronautics

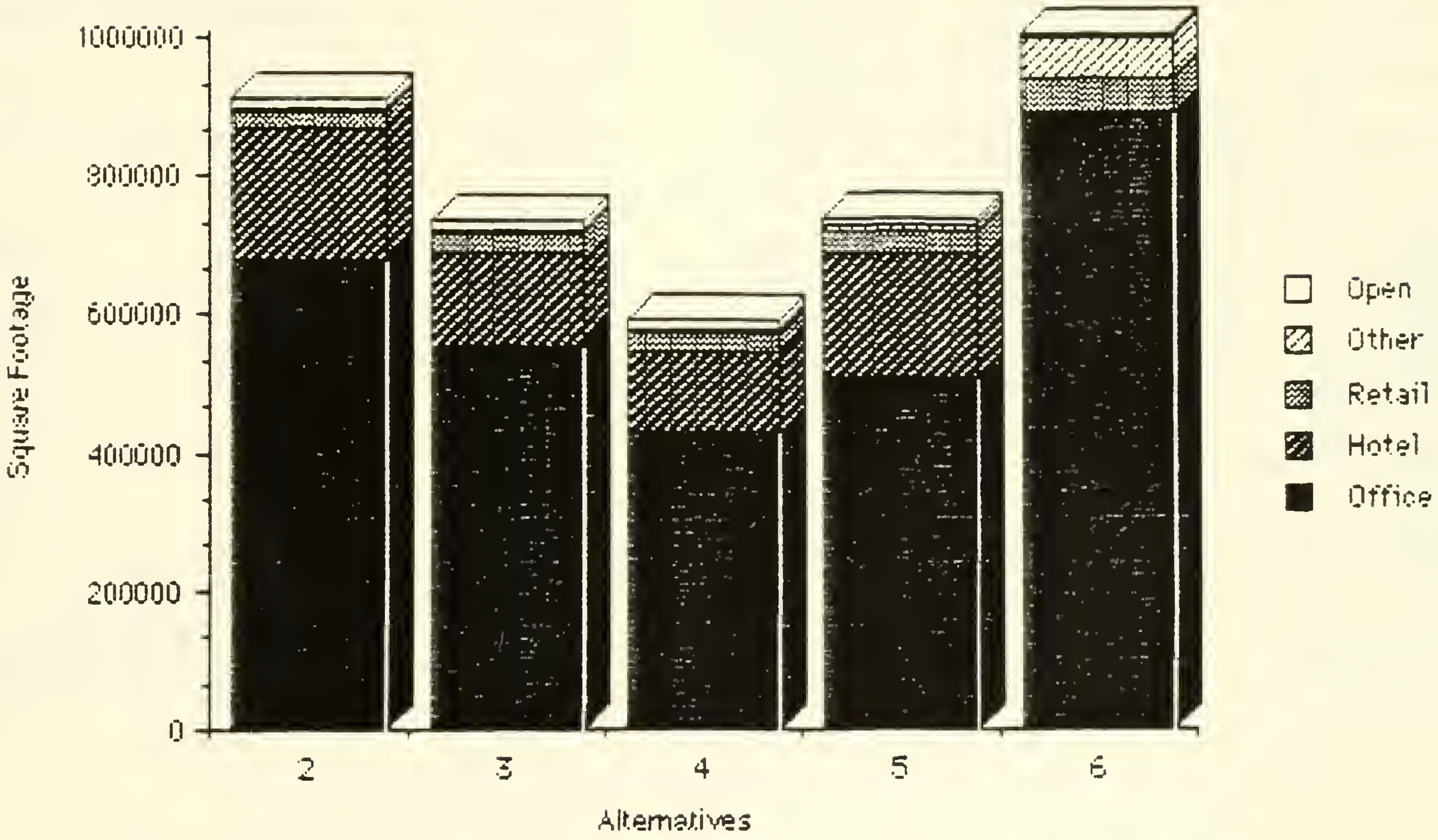


Figure I-2:
Proposed Land Use - Kingston-Bedford-Essex Street

TABLE I-1

Summary Comparison of Alternatives

Parameter	Alternative 2 400 Ft. Tower	Alternative 3 325 Ft. Tower	Alternative 4 250 Ft. Tower	Alternative 5 Expanded Sited	Alternative 6 Developer's Proposal
Site Area (Sq.Ft.)	48,174	48,174	48,174	75,664	75,664
Gross Square Footage	900,000	725,000	580,000	730,000	1,005,000
Land Use (Sq.Ft.)					
Office	679,000	554,000	429,000	510,000	892,000
Hotel	192,000	138,000	118,000	182,000	0
Retail	22,000	26,000	26,000	30,000	54,000
Lobby	7,000	7,000	7,000	8,000	59,000
Open Space	5,600	5,600	5,600	28,464	7,300
Parking Spaces	800	600	600	800	900
Towers	N.W.	N.W.	N.W.	no tower	S.E.
Tower Heights (ft.)	400	325	250	240	465
Floors	34	28	21	19	35
Columbia Street	Open	Open	Open	Closed	Closed
Essex Street	1 lane	1 lane	1 lane	2 lanes	2 lanes

KINGSTON-BEDFORD-ESSEX SITE

ALTERNATIVE 1

Parcel Size	48,174 sf
Garage site	27,427sf
Parking lot	20,747
Existing Use	
Garage	550 cars
Lot	130 cars

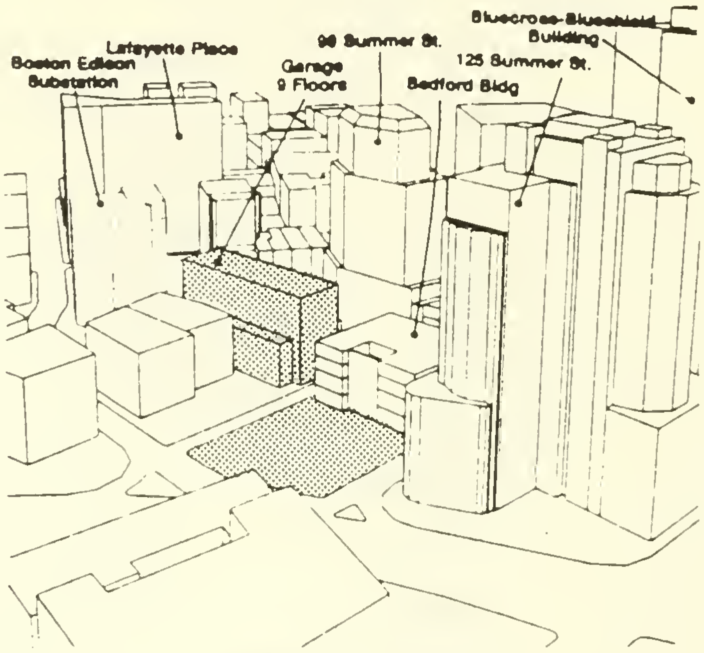


Figure I-3:
Alternative 1: No Build

KINGSTON-BEDFORD-ESSEX SITE

ALTERNATIVE 2

Parcel Size	48,174 sf
Program	900,000 gsf
Office	679,000 gsf
Hotel	192,000 gsf
Retail	22,000 gsf
Lobby	7,000 gsf
Open Space	5,600 sf
Parking	800 cars
Height	400', 250'
Floor Area Ratio	18.7

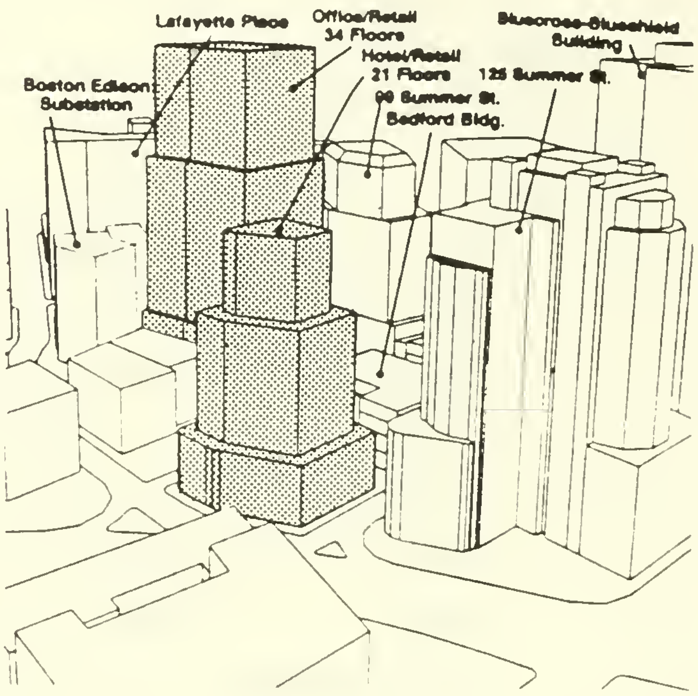


Figure I-4:
Alternative 2: 400 ft. Office Tower

KINGSTON-BEDFORD-ESSEX SITE

ALTERNATIVE 3

Parcel Size		48,174 sf
Program		725,000 gsf
	Office	554,000 gsf
	Hotel	138,000 gsf
	Retail	26,000 gsf
	Lobby	7,000 gsf
	Open Space	5,600 sf
	Parking	600 cars
	Height	325', 200'
	Floor Area Ratio	15

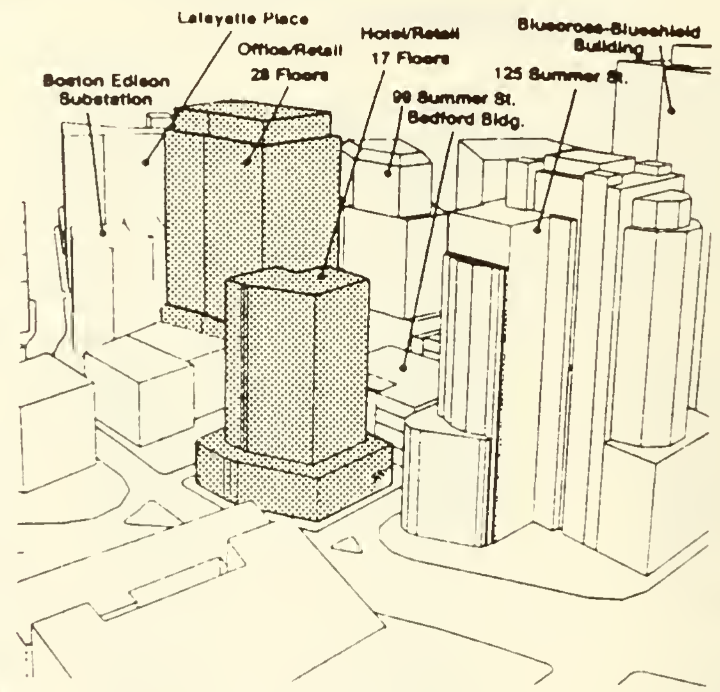


Figure I-5:
Alternative 3: 325 ft. Office Tower

KINGSTON-BEDFORD-ESSEX SITE

ALTERNATIVE 4

Parcel Size		48,174 sf
Program		580,000 gsf
	Office	429,000 gsf
	Hotel	118,000 gsf
	Retail	26,000 gsf
	Lobby	7,000 gsf
	Open Space	5,600 sf
	Parking	600 cars
	Height	250', 150'
	Floor Area Ratio	12

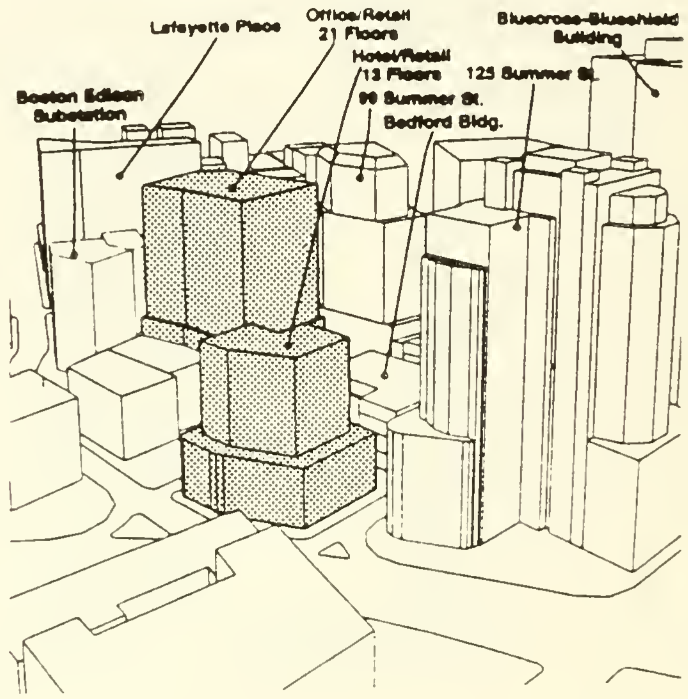


Figure I-6:
Alternative 4: 250 ft. Office Tower

KINGSTON-BEDFORD-ESSEX SITE	
ALTERNATIVE 5	
Parcel Size	75,664 sf
Program	730,000 gsf
Office	510,000 gsf
Hotel	182,000 gsf
Retail	30,000 gsf
Lobby	8,000 gsf
Open Space	28,464 sf
Parking	800 cars
Height	240', 200'
Floor Area Ratio	9.7

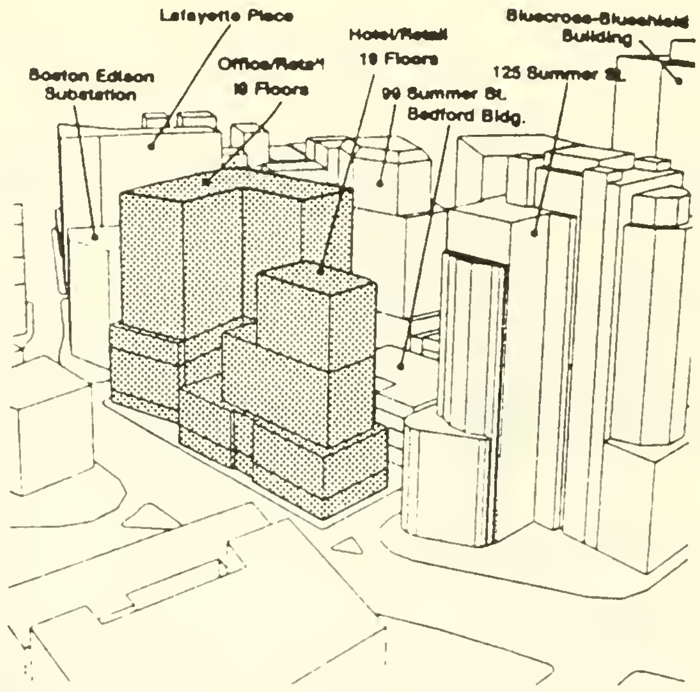


Figure I-7:
Alternative 5: Expanded Site

KINGSTON-BEDFORD-ESSEX SITE	
ALTERNATIVE 6	
Parcel Size	75,664 sf
Program	1,005,000 gsf
Office	892,000 gsf
Retail	54,000 gsf
Lobby/Atrium	59,000 gsf
Open Space	7,300 sf
Parking	900 cars
Height	465'
Floor Area Ratio	13.3

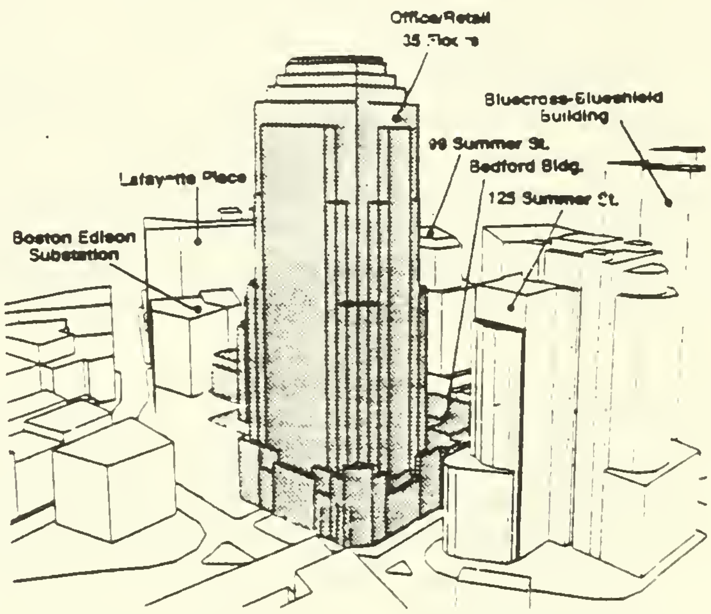


Figure I-8:
Alternative 6: Developer's Proposal

Wind
Historic and Archeological Resources
Open Space and Recreational Facilities
Social and Economic Issues
Construction

The purpose of this summary is to assist reviewers in assessing the major and most important impacts of the proposed alternatives and to highlight key mitigation measures which would minimize adverse impacts. For a more detailed discussion, reviewers should consult the appropriate sections of the main report.

Transportation

Traffic Impacts

The transportation situation in the area surrounding the Kingston-Bedford-Essex Street site is currently complex. Several projects, recently completed or in the advance stages of planning, are adding traffic into the area. These include One Financial Center and the 125 Summer Street office building, east of the project site, and Lafayette Place and its proposed expansion, Boston Crossing, the proposed Commonwealth Center, and 99 Summer Street, directly to the north. The Central Artery project is scheduled to commence construction in the project area in 1994. Current plans call for a southbound on-ramp to the Central Artery at the intersection of Essex Street, Lincoln Street, and the Surface Artery. The widening of Essex Street to accommodate two-way traffic is also under consideration.

The traffic assessment for this project takes into account other proposed developments and estimates the impacts directly associated with the development of the Kingston-Bedford-Essex Street project. To obtain a baseline profile of the current traffic situation, traffic operations were observed to evaluate levels of service (LOS) at eleven intersections in the study area during the morning and evening peak hours and during the Saturday peak hour. Level of service for signalized intersections is defined in terms of delay and is ranked from A to F, where LOS A represents a situation of little or no delay and LOS F represents breakdown conditions. From a traffic operations standpoint, LOS D is considered an acceptable condition in urban areas and represents conditions where the peak hour demands are less than the capacity of the roadway or intersection.

Current Conditions

Generally speaking, traffic is moving during morning peak hours at an acceptable level of service. During the evening peak hour period, the situation is decidedly worse, especially for the intersections along Essex Street. However, only one intersection (Essex-Kingston-Avenue de Lafayette) is operating below a LOS of D. During the Saturday peak period, southbound vehicles traveling on Harrison Avenue experience unacceptable delays at the intersection of Essex, Harrison, and Chauncy Streets (LOS F).

No Build-1993 Assumptions

For the No-Build analysis, the following roadway and development assumptions were adopted:

- Beach Street is closed at the Chinatown Gate; Kingston Street and Edinboro Street are open to the Surface Artery;
- Avenue de Lafayette is closed between Washington Street and Harrison Avenue Extension;
- Hayward Street and Avery Street directions are reversed;
- Phase I and II of the Boston Crossing Project are completed;
- Phase I of the Commonwealth Center is completed;
- the Lincoln Street Central Artery ramp is reversed to become a southbound on-ramp; and
- the Surface Artery is one-way southbound near the Kingston-Bedford-Essex Street project area.

Another project, the widening of Essex Street, is still under consideration. Because this project will significantly alter traffic patterns in the study area, traffic impacts were considered with and without a two-way widened Essex Street.

No Build Conditions/Existing One-Way Essex Street

The new Boston Crossing and Commonwealth Center projects will contribute a large increment of traffic to the area. These projects would rely on Bedford Street and Washington Street for access during the morning peak hour period. During the evening peak hour period, exiting traffic would produce significant pressures along and across the Essex Street corridor. Most of the congested intersections are not signalized but can be improved with appropriate mitigation measures.

Traffic operations can be improved to acceptable levels at the Essex-Surface Artery-Lincoln intersection through channelization within the existing right-of-way along the Essex Street approach (reserved right turn lane from Kingston Street to Surface Artery) and signal rephasing to facilitate right turns.

Traffic operations during the evening peak hour period at the Essex-Washington intersection can be improved to almost acceptable levels (LOS E, close to LOS D) with the installation of left turn and through direction pavement markings and through the institution and enforcement of peak-hour parking restrictions along the eastern Essex Street section between Washington Street and the Surface Artery.

Signalization is the assumed mitigation measure for the unsignalized intersections that operate poorly under No Build conditions. For these unsignalized locations, signalization would bring operating conditions to acceptable levels during all peak hour periods.

Development Project Impacts/Existing One-Way Essex Street

Traffic impacts were analyzed only for Alternative 2 because this alternative would generate the highest peak hour vehicular volumes. The analysis assumed that the No Build traffic mitigation measures have been instituted.

Under this worst case scenario, the traffic operations generally would remain within the same LOS designations as the No Build conditions during weekday peak hour periods. All intersections in the study area would operate within acceptable traffic conditions except the intersection of Essex and Washington Streets, which in the PM peak hour would operate at LOS E.

The project does create a problem at the garage exit along Kingston Street. Here, traffic would operate at LOS E during the evening peak hour period. However, the proximity of the signalized intersections of Bedford-Kingston and Essex-Kingston-Avenue de Lafayette would provide sufficient gaps within the traffic stream to lessen this delay.

No Build Conditions/Proposed Two-Way Essex Street

The Essex Street roadway improvement provides for two-way traffic along Essex Street from Kingston Street to Atlantic Avenue. The widening of Essex Street has been under study for some time by the City. Although there are no final plans to widen the street, past development projects have accommodated the potential reconstruction. Five hundred feet of Essex Street between Atlantic Avenue and the Surface Artery was reconstructed as a two-way roadway with two continuous travel lanes in each direction and curb service lanes where possible. This section of the widening was completed in coordination with the construction of One Financial Center.

Additional work would need to occur to complete the widening, including the following measures:

- provision of revised signalization at the intersection of Essex Street with the Surface Artery;
- acquisition and removal of the two five-story brick buildings at the northeast corner of the Essex-Kingston intersection; and
- reconstruction of 350 feet of Essex Street between the Surface Artery and Kingston Street as a two-way roadway with two travel lanes in the westbound direction and with two through travel lanes and a right turn lane in the eastbound direction.

Assuming that the mitigation measures needed for a one-way Essex Street were implemented, the most significant shifts in traffic resulting from the two-way Essex Street improvement would be the following:

- expected increases in traffic along Avenue de Lafayette approaching Chauncy Street;
- traffic increases along Harrison Avenue between Avenue de Lafayette and Beach Street. These appear high when expressed as a percentage increase due to the low volumes of existing traffic along this section of

the roadway. The increases are mostly a result of improved access to Chinatown via two-way Essex Street;

- significant decreases in traffic volumes along Bedford Street, Summer Street (westbound) between South Street and Lincoln Street, and southbound along Chauncy Street between Bedford Street and Avenue de Lafayette;

- smaller decreases in traffic volumes north of the Surface Artery along Lincoln Street, South Street, and Summer Street (westbound);

- decreased volumes along Essex Street eastbound between Tremont Street and Washington Street, particularly in the AM peak hour, due to the fact that traffic destined for Boston Crossing or Commonwealth Center parking garages can approach the area from the south by using New Essex Street westbound to Avenue de Lafayette westbound rather than Kneeland Street to Washington Street and then to Avenue de Lafayette eastbound; and

- decreased traffic volumes along Chauncy Street north of Essex Street to Avenue de Lafayette and on Washington Street between Kneeland Street and Avery Street.

Development Project Impacts/Proposed Two-Way Essex Street

For the 400 ft. tower alternative, the average expected delay at each location would improve over the existing Essex Street case during all peak hour periods, as follows:

- Summer-Lincoln-Bedford improves from LOS D to LOS C during the evening peak hour period;

- Bedford-Chauncy-Lafayette Place Garage intersection improves from LOS C and LOS D during the morning and evening peak hours respectively to LOS B during both peak hour periods; and

- Essex-Washington improves from LOS E to LOS D during the evening peak hour period.

In summary, the deficient intersections are currently unsignalized. The installation of signals would remedy the deficiencies in most cases. Re-striping, parking restrictions, and signal timing changes would give adequate relief in most other cases with the changes satisfying both the no-build and the critical alternative (400 ft. tower) situations in the 1993 analysis year.

Comparison of Conditions with Mitigating Measures

Table I-2 shows a comparison of existing, No Build, and Development traffic impacts at key intersections with and without a widened Essex Street. The No Build volumes associated with other projects and general growth add the greatest demand to the study area streets. The addition of the Kingston-Bedford-Essex Street project traffic does not change level of service significantly.

The major problem area would be at Essex-Surface Artery-Lincoln for two-way Essex Street, where LOS of F and E would occur during both the AM and PM peak hours for both no-build and build conditions. These levels of service could

TABLE I-2

COMPARISON OF LEVELS OF SERVICE AT KEY SIGNALIZED INTERSECTIONS

Intersection/	Existing		No-Build				400 Ft. Tower Build			
			1-Way Essex		2-Way Essex		1-Way Essex		2-Way Essex	
Analysis Period	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Summer-Lincoln-Bedford										
AM Peak Hour	B	8.8	B	11.8	B	8.9	B	11.6	B	9.1
PM Peak Hour	B	10.5	D	29.2	C	17.1	D	33.1	C	17.7
Bedford-Chauncy-LP Garage										
AM Peak Hour	A	(1)	C	16.0	B	8.6	C	23.9	B	9.2
PM Peak Hour	A/B	(1)	D	25.2	B	9.8	D	29.5	B	11.6
Essex-Surf. Art.-Lincoln										
AM Peak Hour	C	15.1	C	17.1	F	81.2 (2)	D	29.7	F	89.2 (2)
PM Peak Hour	C	18.8	F	74.1	E	48.7 (2)	D	32.8	E	58.7 (2)
Essex-Kingston-Lafayette										
AM Peak Hour	A/C	(1)	B	7.0	B	6.4	B	7.6	B	7.2
PM Peak Hour	D/F	(1)	B	9.8	B	10.6	B	10.7	B	12.5
Essex-Washington										
AM Peak Hour	B	8.3	B	12.7	B	10.1	B	13.6	B	11.7
PM Peak Hour	B	8.8	E	41.6	D	28.5	E	45.0	D	30.6

(1) Existing intersection unsignalized.

(2) These LOS would improve by one level if the plan for a one-way widened Surface Artery were implemented. Also, if two-way Essex were confined to the west of the Surface Artery (without a one-way Surface Artery), LOS would be D +/-, if northbound Surface Artery left turns were restricted.

NB: Analysis assumes implementation of signalization and roadway improvements to improve traffic flow.

be improved if the two-way section of Essex Street proposal were coupled with widening the Surface Artery and making it one-way southbound.

Apart from the Essex-Surface Artery-Lincoln intersection, two-way Essex Street would provide benefits at most other intersections, including that at Essex and Washington Streets, which suffers from low levels of service.

Conclusions

The Kingston-Bedford-Essex Street project would be a relatively small contributor to traffic in the area. New demands from this project would concentrate primarily on the Surface Artery corridor near the Expressway and Turnpike ramp connections. Consequently, the accommodation of the project within its time frame is possible without major street alterations.

By itself, the Kingston-Bedford-Essex Street project would not require the widening of Essex Street for two-way operation. Two-way Essex Street is, however, a desirable project, particularly as a feeder for new development projects to the west (e.g., Boston Crossing, Commonwealth Center, Midtown Cultural District), and as a relief to Beach, Bedford, and Summer Streets.

The evaluation of this project demonstrates the necessity for a close examination of the traffic needs in a wider area. Some type of traffic master planning action is required for the proper comprehension of the cumulative traffic needs, coordinated with the expectations of major planned transportation actions such as the Central Artery/Third Harbor Tunnel project.

Parking Supply and Demand Impacts

The proposed project would eliminate a total of 731 spaces currently existing on the site. Today, most of these spaces serve long-term commuter parking due to the relatively low rates at the mechanical garage.

No Build background development forecasts a peak parking demand in the area for 2,900 spaces, versus an anticipated supply of 1,700 spaces. Thus, there would be a No Build deficit of 1,200 spaces.

For the Kingston-Bedford-Essex Street development options, on-site supply would exceed project demand by 90 to 175 spaces for all options except the 325 ft. Tower alternative, which would have a deficit of only 13 spaces. When the need for replacement parking for the 731 spaces displaced from the site is added to the project demand, however, the deficit ranges from 558 to 744 spaces.

These figures must be interpreted within the context of overall downtown parking policy, which has sought to limit the availability of commuter parking downtown in order to free spaces for visitor use and encourage alternative modes of access.

Public Transportation Impacts

The project is well located with respect to the MBTA rapid transit, express bus, and commuter rail system.

Both No Build and development options would add up to 2-3 additional carloads of passengers per line to the rapid transit system. Given the MBTA's ongoing efforts to add peak hour capacity, the additional demands from any of the options should be able to be reasonably handled by the system.

Pedestrian Impacts

By adding ground level retail activity and providing sheltered walkways through the site, the proposed project would improve pedestrian amenity in what has been an unattractive area in the past. Primary pedestrian flows would occur to and from the site and Downtown Crossing and to and from South Station. The most critical crossing locations are those along the Surface Artery, where traffic flows are the heaviest.

Air Quality

In 1984 carbon monoxide concentrations (CO) in the Essex Street area exceeded that allowed by the National Ambient Air Quality Standards (NAAQS). By 1985 the ambient levels of carbon monoxide were within the Federal and State standards. The primary sources of CO are automobiles, trucks, and buses. Consequently, estimates of air quality impacts from the Kingston-Bedford-Essex Street project were linked to estimates of new traffic generation.

Computer modeling, based on peak flow traffic assumptions, was employed to predict 1993 motor vehicle CO emissions. The increase in CO emissions resulting from the proposed development is not expected to exceed the NAAQS for either the one-hour or the eight-hour period at any of the several sensitive receptor locations analyzed. Any increase in emissions in this area would be mitigated on a general basis as a result of improvements in motor vehicle emissions required by the Federal Motor Vehicle Control Program. On a local level, the improvements in the Central Artery to allow for greater efficiency in traffic flow, the construction of the Third Harbor Tunnel to provide for the diversion of some traffic flow, the widening of Essex Street, and other improvements in traffic flow in and around the project site would contribute to the minimization of CO emissions. Thus, the CO emissions in this area are expected to continue to remain within acceptable levels for the foreseeable future.

Noise

Noise in the project area is created by motor vehicle traffic on the Surface Artery, the Central Artery, and local streets; by aircraft from Logan Airport; by building mechanical systems; and by construction equipment. These sources are typical of an urban environment and create relatively high noise levels. Noise sensitive land uses in the vicinity of the project site include residential buildings south of Essex Street. Existing noise levels along Essex Street are estimated to be 62 dBA (Leq), while levels adjacent to the Surface Artery range from 74 to 78 dBA (Leq).

Estimates of the potential traffic-related noise impacts along Essex Street were assessed for the 1993 No-Build Alternative as a basis for comparison with the build alternatives.

Traffic along Essex Street is expected to increase by 64 percent by 1993 and would result in a noise level of 64 dBA (Leq). This 2 dBA increase over the existing level would not be noticeable. Reconstruction of Essex Street to accommodate two-way traffic would result in an additional 1 decibel increase in noise. This increase translates to 3 decibels over 1988 existing conditions, which also would be an imperceptible impact. Increases of less than 5 dBA are considered to be barely perceptible to the human ear.

Due to projected insignificant increases in noise levels, no specific mitigation measures for traffic generated by the alternatives would be required. However, operational policies which would reduce peak hour traffic volumes (e.g., van pools, car pools, transit ridership, etc.) would contribute to minimizing the overall potential adverse effects of noise on sensitive land uses from the Kingston-Bedford-Essex Street project.

Utilities

Water, sewer, electric, steam, and gas distribution systems are in place for the Kingston-Bedford-Essex Street site. Preliminary analysis suggest that the existing gas, sewer, and water distribution systems would be adequate to accommodate the requirements of any of the proposed build alternatives. Substantial development in the vicinity of the project has prompted Boston Edison Company to plan additional primary power conduits.

The Massachusetts Building Code requires the installation of energy-efficient appliances and the use of energy-efficient building materials and building practices. These efficiencies would reduce the overall impact the Kingston-Bedford-Essex Street development would have on fuel and electric supplies.

Boston's water supply problems persists. While the amount of additional water required to satisfy the needs of the proposed development is relatively small, this small addition would have an adverse impact on the already overdrawn Quabbin/ Wachusetts Reservoir system. To mitigate this impact, compliance with the Commonwealth of Massachusetts Plumbing Code is essential, along with on-site conservation and efficiency in use of the water supplied to the project area.

Because Boston's sewer system consists of combined storm and sanitary drainage, the system typically reaches capacity during intense or prolonged rainfall. Near the Kingston-Bedford-Essex Street site, the sewer system is very old and generally built of brick. Continued rehabilitation and replacement of trunk sewers would reduce the impact of sewer overflows into the surface waters surrounding Boston.

Massing and Shadow

The Kingston-Bedford-Essex Street site is located in a transition zone between the Financial District and Chinatown. The massing analysis addresses how to best express this transition in architectural terms.

The visual quality of the existing garage and surface parking lot is poor. All of the build options would constitute an improvement by creating a better street definition, integrated use of materials and colors, and aesthetically pleasing site organization and building designs. The site currently lacks positive streetscape

features. The parking lots appear uncontrolled in terms of traffic management, fencing, and screening.

An urban design analysis of the five build alternatives has investigated the effects of tower height and placement, as well as the overall massing of the project. Alternatives 2, 3, and 4 are sited only on land currently occupied by the Kingston-Bedford garage and the Lincoln-Essex parking lot. Each of these alternatives has two towers -- an office building located on the garage site and a hotel located on the parking lot. These alternatives test various heights for each building, ranging from 250 feet to 400 feet for the office tower and 150 feet to 250 feet for the hotel. In terms of massing and height, the size of the site in each case constrains the design of the office tower so that there are insufficient setbacks for an area with narrow streets and relatively low buildings. The height of the tower itself seems less significant than the lack of setbacks, particularly near 99 Summer Street. The hotel in each case is lower than the office tower in an attempt to make a transition to the lower structures in Chinatown, with Alternative 4 doing so more successfully than the taller schemes.

Alternatives 5 and 6 are located on a larger site, including all of the block except the Bedford Building. Alternative 5 continues the two-tower scheme of Alternatives 2, 3, and 4 but has the lowest office tower at 240 feet. The expanded site enables the office tower to have larger floorplates than the first three alternatives and also provides the flexibility to set the tower further back from the street. Alternative 6 is even more successful in relating to the low-rise structures at the Kingston and Bedford Streets intersection. With an expanded site and single tower, the massing is redistributed in such a way that the base of the building replicates the existing low-rise buildings. This requires that the tower, which is the tallest of any of the alternatives, be sited close to the Central Artery, in contrast to the design principles inherent in the other alternatives whereby the greatest mass is located on the Kingston-Bedford site.

All of the proposed build alternatives would cause varying degrees of change to the existing shadow environment and would affect several adjacent pedestrian areas by introducing a net increase in shadows. However, due to the intensely built-up character of the project environs, existing shadows already cover much of the area and relatively little additional shadow would be created by the project, except along Bedford and Columbia Streets. Some additional shadow would fall on the Boston Common from Alternatives 2 and 6 during winter mornings.

Aeronautics

The most significant building characteristic affecting helicopter flight paths is height. The tallest existing buildings in the vicinity of the project rise to a height of approximately 600 feet. Since these buildings are higher than any proposed for the Kingston-Bedford-Essex Street development, the project is not likely to have a negative impact on existing helicopter flight paths or interfere with any proposed flight paths or heliport sites.

Wind

A qualitative assessment of pedestrian level wind conditions was undertaken to determine the impact that the five build alternatives would have on the local wind environment. This assessment was based on a review of long term wind records from Logan Airport, information from previous wind studies of 125 Summer

Street, concept designs of the five development alternatives, knowledge of the aerodynamics of buildings, and numerical modeling of the local wind environment.

Table I-3 provides a subjective comparison of the wind climate anticipated around the six development alternatives. The following discussion summarizes the findings for each alternative.

Alternative 1 - No-Build

Wind speeds comfortable for the intended pedestrian activities are expected on Kingston, Essex, and Columbia Streets. On Bedford Street, however, strong upper level winds would interact with 99 Summer Street and create less comfortable pedestrian level wind conditions. On Lincoln Street, upper level winds deflected downward by 100 and 125 Summer Street result in uncomfortable wind conditions, which, in some cases exceed Boston Redevelopment Authority criteria.

Alternative 2 - 400 ft. Office Tower

Wind speeds significantly higher than existing conditions, are expected along Bedford, Kingston, and Columbia Streets, in the pedestrian area south of the Bedford Building, and at the south end of Lincoln Street. Wind speeds in each of these areas may be uncomfortable for intended activities. There is the potential for wind speeds to exceed BRA guidelines at the building corners. Wind conditions will improve slightly at the north end of Lincoln Street, while conditions similar to existing site conditions are expected on Essex Street.

Alternative 3 - 325 ft. Office Tower

The 75 foot reduction in the height of the office tower from that of Alternative 2 is not expected to alter significantly pedestrian level winds. On the south end of Columbia Street, in the pedestrian area south of the Bedford Building, and on Lincoln Street, the reduced floor plate for the hotel/retail tower (when compared to Alternative 2) and the podium would lessen the impact of development on the pedestrian level wind conditions in those areas. Some of the wind shelter provided to the north end of Lincoln Street for Alternative 2 would be lost, as the smaller tower would not be able to block as much wind.

Alternative 4 - 250 ft. Office Tower

Wind speeds and wind comfort levels for this alternative would be similar to Alternative 3. The reduction in the office tower height when compared to Alternative 2 may be enough to lessen the impact of the development on the wind conditions on Kingston and Bedford Streets and parts of Columbia Street. However, wind speeds would remain well above the levels that presently exist and are likely to be uncomfortable for pedestrians.

Alternative 5 - Expanded Site

This alternative would increase wind speeds on Kingston, Essex, Columbia, Bedford, and Lincoln Streets. Generally, the lower buildings would deflect less wind to the street, but these benefits would be off-set by the broader building facades

AREA OF CONCERN	ALTERNATIVE 1	2	3	4	5	6
Kingston	○	●	●	◍	●	○
Essex	○	○	○	○	●	●
Essex-Surface Artery	○	●	○	○	●	●
South end of Lincoln	◍	●	◍	◍	●	●
North end of Lincoln	●	◍	◍	◍	◍	◍
Bedford Street	◍	●	●	◍	●	○
North end of Columbia	○	●	●	◍	○	○
South end of Columbia	○	●	◍	◍	●	N/A
Bedford Building Plaza	○	◍	◍	◍	○	N/A

● **POOR** Strong winds which are likely uncomfortable and could exceed BRA guidelines. Mitigation will be required.

◍ **FAIR** Accelerated winds noted for some directions and conditions may be uncomfortable for some activities. Some minor mitigation may be required.

○ **GOOD** Areas of wind shelter or slower wind speeds. Acceptable wind conditions are anticipated.

Table I-3
Summary of Pedestrian Level Wind Conditions: Qualitative Analysis

for this alternative. Uncomfortable winds could be anticipated in most areas around the site.

Alternative 6 - Developer's Proposal

This design alternative would slightly improve pedestrian level winds at the north end of Lincoln Street and on Bedford and Columbia Streets. Winds which are similar to existing conditions may be expected on Kingston Street. Wind speeds which are higher than the no-build condition and winds which are uncomfortable for intended activities could be expected on Essex and Lincoln Streets.

Mitigation measures in the form of landscaping and architectural details can improve wind conditions. As part of the Final EIR, quantitative wind speed measurements in a boundary layer wind tunnel are recommended to define accurately the no-build wind conditions and to quantify the impact of the selected development alternative.

Historic and Archeological Resources

The project site is located in an area of downtown Boston that has a number of historic buildings and districts. To the north of and adjacent to the site is the Commercial Palace District. To the south of the site is the Kingston-Essex Textile District, and to the southeast is the Leather District.

There are no structures on the site which are Boston City Landmarks or are individually eligible for listing or are listed in the National or Massachusetts Registers of Historic Places. However three historic structures in the vicinity may be affected by the proposed development. They include the Church Green Building, the Bedford Building, and the Proctor Building, all of which are registered landmarks. Two other buildings, 80-86 Kingston Street and 88-100 Kingston Street, are included in the project site for some of the alternatives. Although individually these buildings have been determined not to be eligible for National Register listing, the Boston Landmarks Commission has characterized them as contributing structures to the Kingston-Essex Street Textile District, in which they are located.

All of the build options would have an effect on the surrounding historic resources. However, as long as the detailed design of a selected alternative incorporates elements to mitigate those impacts, then any of the build options would have more beneficial impacts on these resources than the No Build Alternative.

To emphasize the historic character of the area, detailed project design should incorporate features of the nearby historic structures and of the Commercial Palace and Kingston-Essex Street Textile Districts in the choice of building height, materials, fenestration and facade, setbacks, and mass. If the bases of the proposed structures are similar in height to the nearby historic structures, and have similar setbacks, similar facades, and compatible materials and design characteristics, potential adverse effects of the project on the historic surroundings should be mitigated.

The project site may contain significant subsurface archaeological resources relating to prehistoric Indian occupation and/or the earliest European settlement of the area. As a result, any development of this site could significantly affect archaeological resources, since all the build options entail substantial excavation

for subsurface parking. To ensure that any potential archaeological resources are not unnecessarily disturbed or destroyed in the development process, it is recommended that an archaeological reconnaissance survey be conducted and the results included in the Final Environmental Impact Report.

Open Space and Recreational Facilities

The No Build alternative would have no beneficial impacts on open space nor provide opportunities for recreation. There are no facilities on the site for passive or active recreational activities, and the open space that does exist contains no improvements. The site in its current condition lacks pedestrian corridors and thus poses some danger to pedestrians from vehicles entering or exiting parking lots.

All of the build alternatives would significantly enhance open space and recreational facilities by adding public plazas, pedestrian corridors, lobbies, arcades, and landscaping. Alternatives 5 and 6 also include the widening of Essex Street and the closing of Columbia Street, thereby creating pedestrian areas more protected from traffic. Alternative 6 also proposes a multi-story public atrium, a retail arcade, and a pedestrian network which would add to the pedestrian amenities in the area.

Social and Economic Issues

In the past, economic development in Boston's disadvantaged neighborhoods has brought short-term benefits without creating an enduring and strong economic base. The Kingston-Bedford-Essex Street project is designed to reverse this trend and to respond to the community's need for employment, community facilities, and housing.

The creation of construction and permanent jobs would go hand-in-hand with training programs, community outreach, and affirmative action. The developers also will participate in the construction of affordable housing and contribute substantial funds to a Community Development Fund.

The development program also calls for a minimum of 30 percent of all development-related consultant contracts be targeted to certified minority- and women-owned businesses. In addition, the developers will work with public and private agencies to provide technical assistance to minority businesses and encourage the formation of a small business incubator program.

Finally, the terms of this linkage program require that the developers construct a child care facility for 100 children on a site near or in Chinatown.

Construction

All build alternatives would result in temporary adverse impacts in the vicinity of construction activity. These include:

- a temporary increase in on-site noise levels from operation of construction equipment;
- potential periodic disruption of pedestrian and vehicular flows;
- temporary increase in pollutant emissions from on-going construction operations; and

- potential lowering of groundwater levels due to dewatering efforts.

Most of the above impacts would be of short duration and negligible. Nevertheless, careful construction management planning would be required to minimize these impacts. This planning would include coordination of construction schedules, truck routing, and staging areas between Kingston-Bedford-Essex Street and other projects in the area. Construction equipment should be outfitted with noise attenuation devices. Groundwater levels should be carefully monitored during excavation, and any silt should be removed from the withdrawn groundwater before it is discharged into the storm drain system. Finally, the plan should include procedures for reducing dust, debris, and emissions during construction.

G. Conclusions

The analysis of all the environmental and socio-economic factors yields one preeminent conclusion: the proposal to develop the Kingston-Bedford-Essex Street site for commercial and retail use offers many advantages over the current use of the land for parking.

- The project will offer new employment and business opportunities for the Downtown and nearby Chinatown.
- Use of the land for office space, retail stores, and possibly a hotel will result in a higher tax base for the City.
- The project will significantly improve the visual quality and safety of the area by adding better street definition, new public spaces, a network of pedestrian walkways, and the opportunity for a building design which blends with the rich historical character of the area.
- The project does not require any major changes to the transportation or utility infrastructure. The widening of Essex Street will improve traffic flows, but it is not a required element of this project.
- All of the build alternatives will have a minimal impact on traffic, noise, and air quality.
- The project will reduce the number of parking spaces available for all-day commuter parking. However, this is consistent with a City of Boston parking policy which has sought to limit the availability of commuter parking downtown.
- The community benefits package associated with this project and the development of Parcel 18 exceeds those proposed for any project to be built in Boston.

The analysis of alternatives was designed to test key parameters of the project. The most important parameters were:

- height, location, and number of the office towers;
- overall size of development;
- site coverage; and
- disposition of Essex and Columbia Streets.

By structuring the alternatives to isolate and analyze these factors, no single alternative has surfaced as preferred over all others. What has emerged is a set of recommendations to guide the final design of the project.

- From the standpoint of visual quality, location of the tower at the corner of Lincoln, Essex, and Columbia Streets and the lower building elements on the Kingston-Bedford block successfully addresses the transition from the Financial District to Chinatown.
- Development may degrade the wind conditions at pedestrian level, especially around building corners and major street intersections, especially if it is not properly designed. Landscaping and architectural details, if properly applied, can modify these wind impacts. Quantitative wind speed measurements need to be taken as part of the Final EIR and the results incorporated into the final building design.
- Use of the private parcels affords greater opportunity to increase site coverage, to lower building heights, and to better integrate the development with the existing area.
- The closing of Columbia Street provides the opportunity to create additional pedestrian open space and reduce traffic-induced noise.
- Normal traffic growth in the area will create unacceptable levels of congestion, independent of whether or not this project is built. Additional traffic signals and other appropriate mitigation measures can improve the situation and should be implemented within the next five years.

II. Environmental Setting

A. Area Description

Project Environs

The Kingston-Bedford-Essex Street site lies at the juncture of five important Central Boston districts: Chinatown to the southwest, the Midtown Cultural District to the west, the Financial District to the immediate northeast, the Commercial Palace District to the north, and the Leather District, across the Surface Artery, to the southwest (see Figure II-1). Boston's downtown shopping area, including the Downtown Crossing retail center with its department stores and numerous smaller retail and service stores, is within walking distance of the site. Three hundred feet east of the site is South Station, a major subway, railroad, and bus facility serving the metropolitan and regional area. To the southwest of the project site is the Tufts/New England Medical Center complex on the edge of Chinatown.

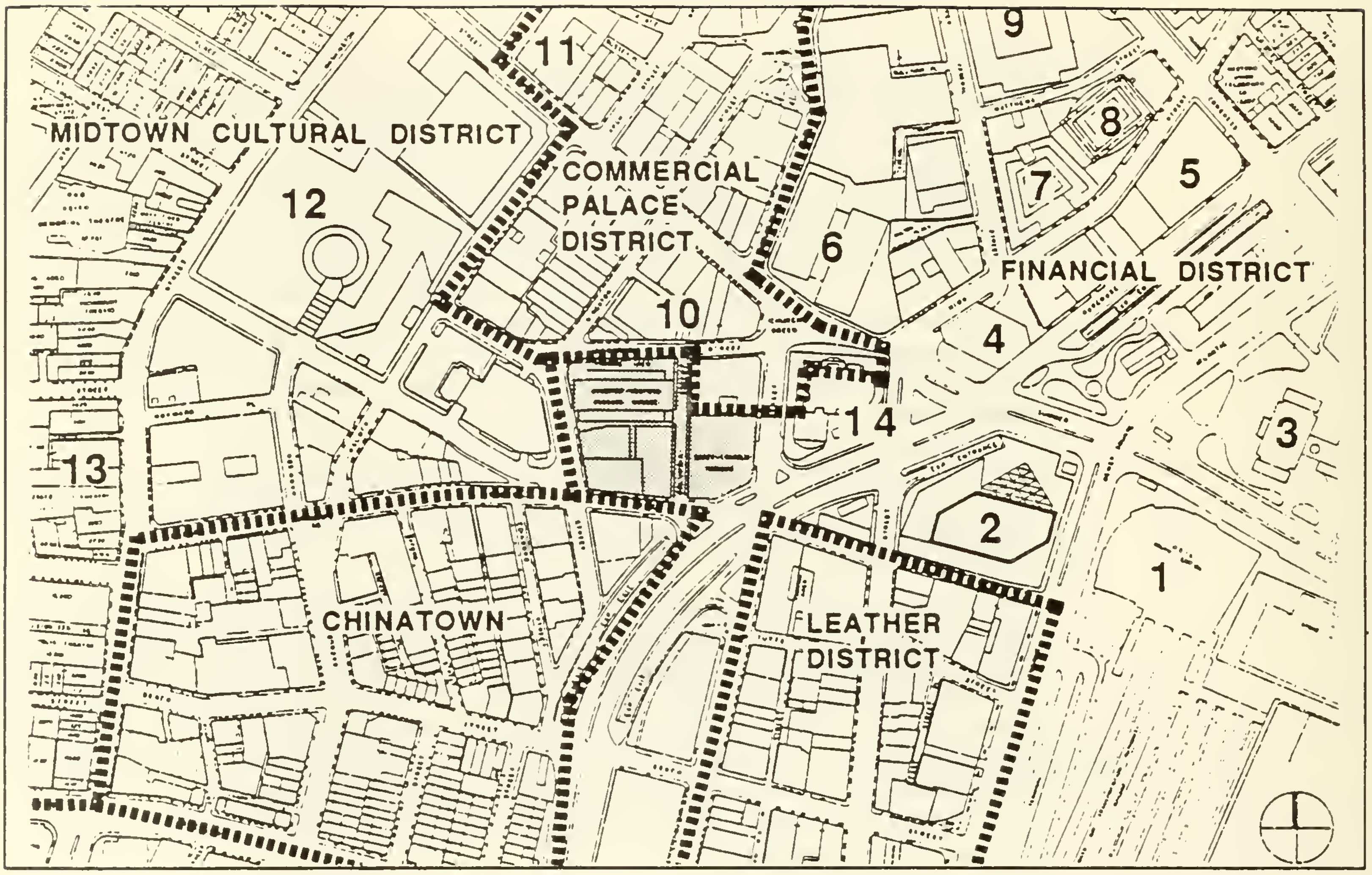
Other important nearby places include the open space and recreational facilities of the Boston Common and Public Garden to the west and the governmental offices at Government Center to the northwest.

Revitalization of Boston's downtown has led to a number of important retail and office developments in the immediate area. These include One Financial Center, east of the project site; Lafayette Place and the proposed Commonwealth Center, northwest of the site; and 99 Summer Street, directly to the north. Also, the l25 Summer Street office building, currently under construction, will occupy the entire Lincoln block immediately east of the project site (see Figure II-2). These projects are described in greater detail in the sections which follow.

Recent Developments

The project vicinity has become the focus of much of Boston's recent growth. The major private sector investments which have been made include the following projects:

- **Lafayette Place**, completed in 1984, is a large retail center comprised of 200 stores and restaurants, a 500-room hotel, and an l,l50-car garage. The development of Lafayette Place, located just to the west of the project site on Bedford Street, has extended the Downtown Crossing retail center closer to Essex Street and the project site. However, the retail mall has encountered numerous problems and is scheduled for reconstruction.
- **One Financial Center**, located just to the east of the project site, is a 45-story office building bounded by Summer Street, Atlantic Avenue, Essex Street, and South Street. It contains l,l00,000 square feet of office space and ground floor retail space. This project, which includes an easement for the widening of Essex Street, also was designed to allow for the future construction of walkways through the second story of the tower for pedestrian bridge connections from the South Station Transportation Center to Dewey Square.
- The **99 Summer Street** office building occupies a portion of the historic Church Green block. The building is directly adjacent to the project site on the north side of Bedford Street, with entrances on Summer Street and Bedford Street. These entrances are connected by a pedestrian arcade. The building is 20 stories in height and includes approximately 240,000 gross square feet of office, ground floor retail, and underground parking.



MAJOR BUILDINGS

1. South Station

2 .One Financial Center

3. Federal Reserve Building

4. Fiduciary Trust Building

5. Keystone Building

6. Blue Cross/ Blue Shield Building

7. 160 Federal Street

8 150 Federal Street

9. Bank of Boston Building

10. 99 Summer Street

11.101 Arch Street

12. Lafayette Place

13. Midtown Cultural District

14. 125 Summer Street

Figure II-1:
Boston Districts Adjacent to Site

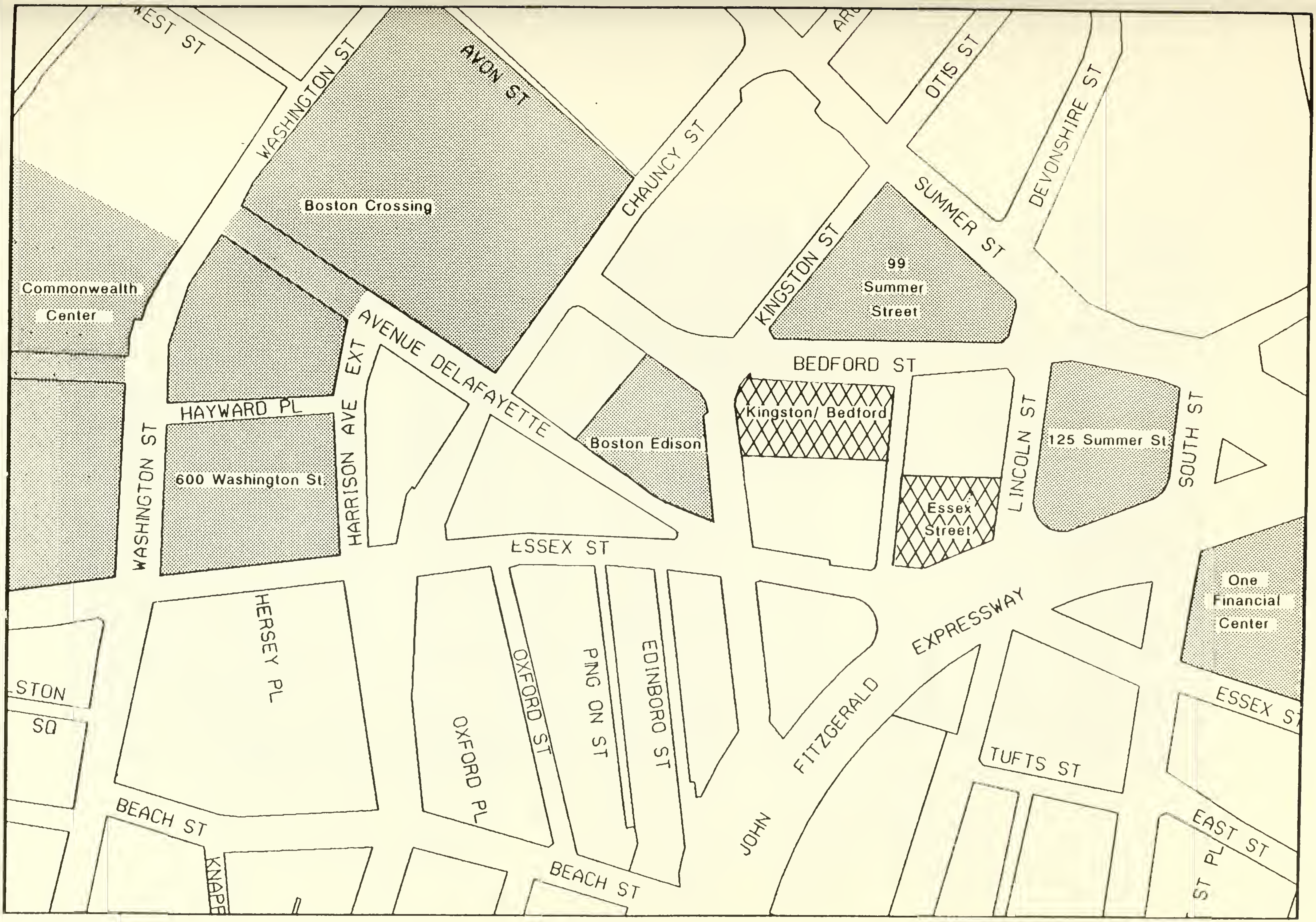


Figure II-2:
Recent and Proposed Area Developments

- The **125 Summer Street** office building is located directly adjacent to the site on the east side of Lincoln Street with entrances at Summer Street, South Street, and Lincoln Street. This project, which is currently under construction, consists of a 23-story, 300 foot office tower and 5 levels of underground parking. The building, of approximately 450,000 gross square feet, will primarily be used for office space with ground level retail space and includes a pedestrian passage from the Surface Artery to Lincoln Street as part of its internal connections.

- The **Boston Edison Company** is constructing an addition to its sub-station at Kingston Street, across the street from the Kingston-Bedford garage. When completed in the summer of 1989, the substation will augment and reinforce the electrical supply to downtown Boston.

Proposed Developments

A number of additional commercial projects and major changes to Boston's infrastructure will alter the urban landscape in the immediate vicinity of the Kingston-Bedford-Essex Street site.

- The **Boston Crossing** project involves the reconstruction of the Lafayette Place/Jordan Marsh complex and new construction on the adjacent Hayward Place site and a portion of Avenue de Lafayette. It comprises a mixed-use development that proposes the replacement of the existing Jordan Marsh store at Summer and Washington Streets with a new six-story retail facility with a 750,000 square foot office structure above, the construction of a five-story department store and an office tower above on Haywood Place, the replacement of Lafayette Place mall with a new five-story specialty retail galleria, and the addition of 700-1,000 below-grade parking spaces which will be connected to the existing Lafayette Place garage. Currently undergoing review by the City and the BRA, this project is expected to begin construction in the beginning of 1990.

- Across Washington Street from Boston Crossing is the proposed **Commonwealth Center** project, which envisions the development of approximately 1.8 million gross square feet of office, retail, hotel, and cultural uses on portions of the two blocks bounded by Washington, Tremont, Boylston, and Avery Streets in the Midtown Cultural District. Included in the project are proposals for two theaters, including the renovation of the historic Paramount Theatre, and below-grade parking for 1,000 automobiles. This project likewise is undergoing City and BRA review. To be built in two phases, Commonwealth Center is projected to be completed by 1996.

- **South Station Transportation Center**, located on Atlantic Avenue east of the project site, is part of the South Station addition and renovation project. The MBTA is improving commuter rail and bus facilities, and the Federal Railroad Administration is completing improvements to the station as part of the Northeast Corridor improvement project. Future air rights development over the track area of the station include proposals for a regional bus terminal, up to 2,000 parking spaces, and approximately 1 million square feet of office space.

  The South Station Transportation Center is located 300 feet east of the site. At this location it will function as a major pedestrian traffic node and serve as a regional departure and destination point for subway, commuter railroad, and private bus line commuter traffic. It is expected that the South Station Transportation Center will generate 35,000 pedestrian trips per day by commuters walking to nearby Central Business District and Financial District locations. A majority of these pedestrian trips will

be via the Dewey Square area, which is adjacent to the northeastern corner of the project site.

° The **Third Harbor Tunnel/Central Artery** project includes the construction of a new four-lane tunnel under Boston Harbor, connecting the Massachusetts Turnpike to Logan Airport via a Seaport Access Road through commercial land in South Boston, and the complete reconstruction and depression of the Central Artery in downtown Boston. Expected to begin in 1989, this ten-year project will complete the Interstate highway system in Boston and double the capacity of the Artery. The Central Artery portion of the project involves the replacement of the existing six-lane, elevated section of the Artery with an underground eight-to-ten lane road between Charlestown and the Southeast Expressway. The Central Artery to the east of the site will be divided into a south bound traffic section (the existing tunnel) and a new tunnel for northward bound traffic under Atlantic Avenue. This bisection traffic carrier will divide south of the project site near the Turnpike interchange and will reconverge north of the site area.

  The proposed Third Harbor Tunnel and Central Artery improvements are intended to increase the capacity of this major regional traffic facility and thus relieve traffic congestion within the system as well as on alternative routes in South Boston and the South End areas, which have been used to bypass traffic jams on the Central Artery.

° **Essex Street Reconstruction**. A proposed widening and reconstruction of Essex Street as a two-way roadway from Kingston Street to Atlantic Avenue is currently under study by the City's Transportation Department. The benefits and costs involved with the project will be carefully assessed within the context of several planning projects. The most important of these projects include the Midtown Cultural District Plan, the Chinatown Neighborhood Master Plan, the Downtown Circulation Plan, and the Central Artery depression. Taken together, these studies will provide a full analysis which will allow a decision to be made which rationally balances local and area-wide interests. It is expected that the decision on whether or not to reconstruct Essex Street will be made in 1989.

° **MBTA South Boston Transit Line**. As part of its South Boston Piers/Fort Point Channel Area Transit Study, the MBTA has under consideration, as its leading alternative, a proposal to build a new midtown public transit line linking the Midtown Cultural District to the Fort Point Channel development area. The proposal envisions an underground alignment, utilizing light rail vehicles or dual-propulsion buses, which would start at the Boylston Station on the Green Line and connect to the east, via Boylston and Essex Street, to the Orange Line and to the Red Line at South Station and then continue across the Channel into the South Boston piers area. As proposed by the MBTA, the tunnel would occupy 50 feet of Essex Street, as shown in Figure II-3. The preliminary MBTA plans show the proximity between the northern tunnel tube and a fifth belowground parking level. During the design phase of the project, the MBTA, BRA, and the project developers would need to meet to coordinate planning, timing, financing, and construction of the transit tunnel. A decision on this proposal is expected to be made in early 1989.

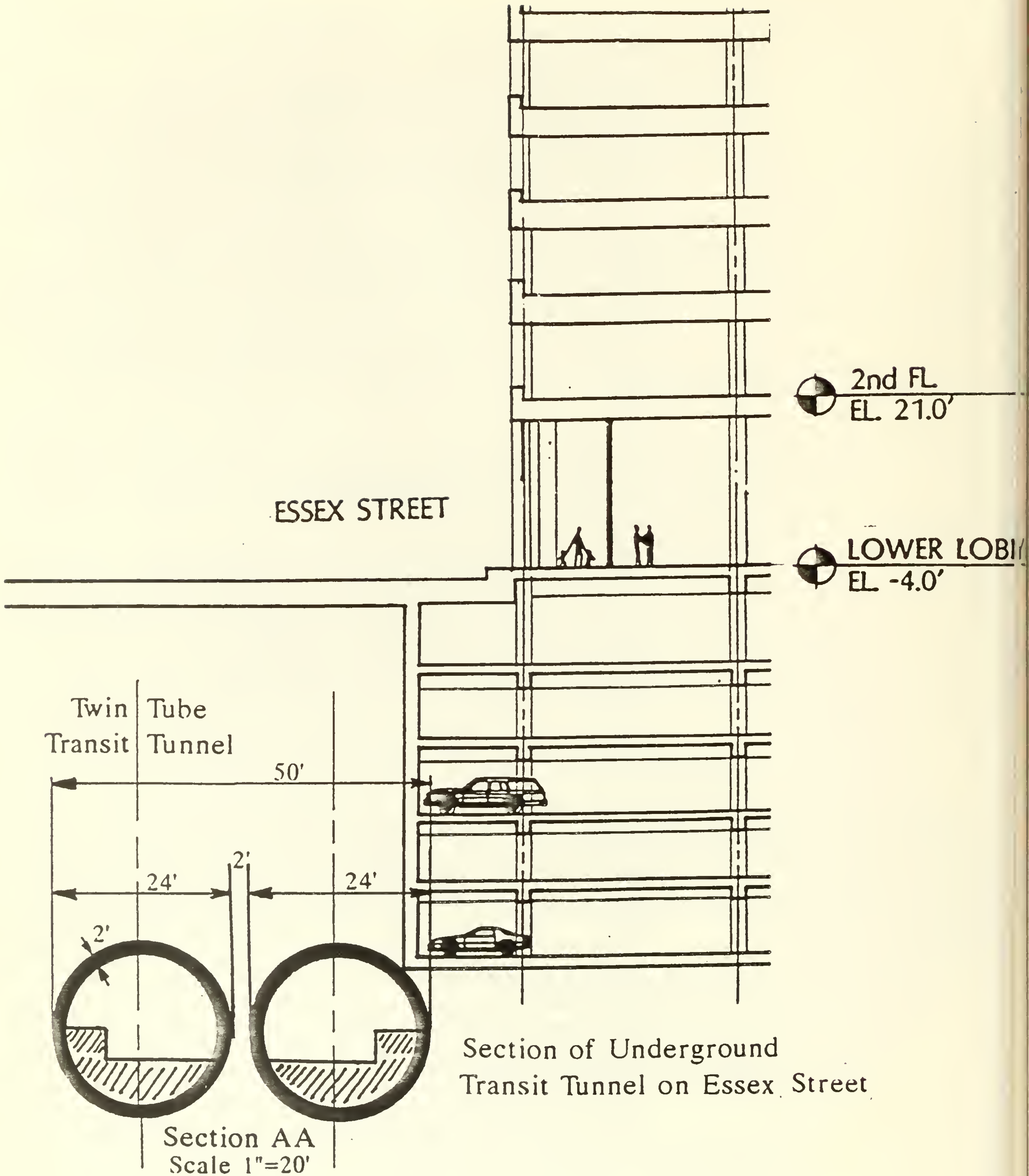


Figure II-3:
South Boston Transit Line

B. Site Description

Historic Development

The Kingston-Bedford parcel is situated on a site developed early in Boston's history. During colonial times, this parcel of land was part of the original Boston land mass on the Shawmut peninsula, near the waterfront, in the midst of a fashionable residential area rich in architecturally significant homes. In the 1830's, the ever-increasing commerce of the city created a need for buildings to house the variety of goods arriving by water. Gradually, the residential dwellings were replaced by granite warehouses, used for storing merchandise and materials awaiting transfer to the rail system, which soon turned the area into the center of Boston's drygoods and leather businesses. In 1872, a massive fire swept through Boston proper destroying more than 700 buildings, including the warehouses. Construction to replace them began immediately and utilized new fireproof construction techniques. Most of the new warehouses were five to six stories high, with fronts of granite and mansard roofs. Several examples of this style of construction are still present in the area.

Existing Situation

Today, several structures facing the Kingston-Bedford site are architecturally noteworthy and have influenced the design of the project: the Bedford Building, the Church Green Building, and the Proctor Building, along with four facades from 115-121 and 131-139 Summer Street and a facade on Lincoln Street at the corner of Summer Street, all fine examples of architectural detail. At the present time, the Kingston-Bedford-Essex block is partially occupied by four buildings: the Bedford Building on the northeast, two masonry buildings on Kingston Street, and a seven story parking garage on the northwest corner built and owned by the City of Boston. The balance of the site is used for surface parking. In its present-day appearance, the Kingston-Bedford-Essex parcel no longer speaks to its rich historical heritage.

Geology and Soils

The project site is located on the original Shawmut peninsula which consists of rock and soil created by the retreat of glaciers from the Ice Age. The Boston area is believed to have been a part of a coastal area which was submerged early in the geologic age of the city and later uplifted, creating a rocky and irregular coast line. While present day Boston consists of both original uplifted rocky areas and back-filled flat areas, the project site itself is located on that part of the Boston characterized as the original land mass area, situated near the colonial shoreline. The topography of the site is relatively flat, sloping down gently from about El.28.5 (BCB) along Bedford Street to about El.20 (BCB) along Essex Street.

Sub-surface soils in the immediate area have been extensively investigated by Haley & Aldrich for several nearby projects. Available data indicate that the soils consist of glacial and marine deposits and man-placed fillings. Test borings show the following probable types of soils at the project site (Haley & Aldrich, 1988).

- **Miscellaneous Fill**, consisting of dense to loose, brown to black, coarse to fine sand with varying amounts of silt, clay, coarse to fine gravel and cobbles, and smaller amounts of brick, wood, asphalt, and building rubble. The fill thickness is expected to range from 10 to 15 feet.
- **Glacio-marine Silty Clay** deposits, frequently interbedded with sand layers or lenses, which underlie the miscellaneous fill. The thickness of the silty clay is expected to increase from about 15 feet near Bedford Street to about 30 feet near Essex Street. This clay is hard to medium

stiff in consistency and contains little to trace amounts of coarse to fine sand and fine gravel. Interbedded in or overlying the silty clay are frequent water bearing, silty fine sand layers or lenses. The sand is very dense to medium dense and ranges in thickness from several inches up to 10 feet, as encountered near the southeast corner of the site.

- **Glacial Till**, underlying the silty clay. The till is dense and very stiff in consistency. The top of the till layer may average at about El.0 (BCB) near Bedford Street, dipping generally from northeast to southwest to about El.-25 (BCB) near Essex Street. Accordingly, the thickness of the glacial till stratum is expected to decrease from an average of about 45 feet near Bedford Street to about 30 feet near Essex Street.

- **Bedrock**, locally known as the Cambridge Argillite (or Slate). Underlying the glacial till, the bedrock is a fine-grained, clayey rock, very soft to moderately hard, and completely to moderately weathered. The rock also is slatey in places and contains occasional clay seams. Top of the bedrock is expected to average at about El.-45 (BCB) near Bedford Street, dipping from north to south to about El.-55 (BCB) near Essex Street.

Groundwater levels were found to fluctuate near the fill-silty clay interface at about 12 to 16 feet below the ground surface and to respond quickly to heavy precipitation. As with the site topography, groundwater elevations are expected to decrease gradually from north to south, averaging at about El. 15 (BCB) near Bedford Street to about E. 5 (BCB) near Essex Street. The lower levels also may be due to a slight depression resulting from the permanent dewatering system for the expressway tunnel.

III. DEVELOPMENT ALTERNATIVES

A. Guidelines for Development

This chapter describes six alternatives for the proposed development on the Kingston-Bedford-Essex Street site. The alternatives incorporate building site requirements, development guidelines established by the BRA, and design preferences advanced by the community and developers. In order to explore the implications of various building heights, development programs, traffic and access variables, each build alternative represents a different design concept.

In the project's earliest stages, the Boston Redevelopment Authority established a set of design guidelines to ensure that development of this site met the needs of the community and limits any adverse effects stemming from its implementation. These guidelines are presented below. The guidelines provide direction to the developers and serve as a set of standards that the community can use in its review process.

- The Kingston-Bedford-Essex Street project will be a mixed-use development encompassing office space, retail stores, and public space.
- Uses must include childcare facilities, retail, or other public activities at street level to enliven the area and provide goods and services to people who live, work, and shop in Chinatown and downtown. Subsurface parking is required with a portion of spaces to be available to the public.
- Building mass shall reflect the proportions and dimensions of the historic and characteristic buildings in the surrounding Washington Street and Essex Street areas. Setbacks and accentuated cornices shall be provided at upper floors to relate to and reinforce heights of existing buildings which contribute to the character and scale of the district.
- Materials and architectural details must enhance the character of the surrounding Washington Street and Essex Street areas. Light-colored natural stone exterior materials are required. Details of fenestration, entries, rooftops, cornice lines, and other architectural features shall provide a sense of human scale and continuity with Boston's architectural heritage.
- Strong cornices at the top of the streetwall are characteristic of the area, and their inclusion in the design of new buildings is encouraged.
- Windows articulated as singular and individual openings in the exterior wall and surrounded with masonry, as opposed to ribbon-windows or curtain-walls, are typical in the area and this mode of expression is encouraged.

B. Building Sites

Development alternatives were also guided by the parcels available for development. The project site consists of two parcels owned by the City of Boston. One, the Kingston-Bedford garage, is located on the northern half of the block bounded by Bedford, Kingston, Essex, and Columbia Streets. The garage occupies a 27,427 square foot parcel. The other is the Essex Street parking lot (20,747 sq. ft.), located at the corner of Essex, Lincoln, and Columbia Streets (see Figure III-1).

Figure III-1:
Building Sites

Two privately-owned buildings, 80 and 88 Kingston Street, are adjacent to the Kingston-Bedford Garage. There is also a privately-owned parking lot at 128 Essex Street. These parcels were considered potentially available for development. The square footage of these areas is as follows:

80 Kingston Street	6,904 sq.ft.
88 Kingston Street	7,362 sq.ft.
128 Essex Street	9,074 sq.ft.

In addition, some alternatives assume Columbia Street, which is 7,250 square feet in area, would be closed and included in the project. There is also a proposal to widen Essex Street in order to accommodate two-way traffic. Should the street be widened, it would necessitate taking 3,100 sq. ft. of land along the Essex Street edge of the project site. Two alternatives, Alternatives 5 and 6, are predicated on the Essex Street widening, and include both the public and privately-owned parcels.

C. Alternatives Considered

Six alternatives were developed to test the consequences of different land uses, building design, and parcel size. The alternatives are:

Alternative 1:	No Build
Alternative 2:	400 ft. Tower
Alternative 3:	325 ft. Tower
Alternative 4:	250 ft. Tower
Alternative 5:	Expanded Site
Alternative 6:	Developer's Proposal

The key parameters which distinguish these alternatives are: (1) the height and location of the major office tower; (2) the number of towers; (3) the square footage of site actually developed; and (4) the final disposition of Columbia and Essex Streets.

Alternatives 2, 3, and 4 test the effects of different tower heights located on the Kingston Street garage location. These alternatives also assume that the project would be built on the City-owned parcels exclusively. Columbia Street would remain open and Essex Street would remain open for one-way traffic. Alternatives 5 and 6 assume the widening of Essex Street and the inclusion of the three privately-owned parcels adjacent to the garage. The Developer's Proposal, Alternative 6, also tests the impact of locating a tall tower on the southeastern corner of the site at the corner of Essex and Lincoln Street.

Table III-1 compares the land uses proposed for Alternatives 2 through 6. All build alternatives feature a building complex with commercial office space as the predominate use and underground parking for 600 to 900 automobiles. Alternatives 2, 3, 4, and 5 also contain a hotel and a small amount of retail space. Alternative 6, the Developer's Proposal, features office space, expanded retail space, and an atrium with pedestrian passageways.

TABLE III-1

Summary Comparison of Development Alternatives

Parameter	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
Site Area (SF)	48,174	48,174	48,174	75,664	75,664
Development Program (SF)	900,000	725,000	580,000	730,000	1,005,000
Office	679,000	554,000	429,000	510,000	892,000
Hotel	192,000	138,000	118,000	182,000	0
Retail	22,000	26,000	26,000	30,000	54,000
Lobby	7,000	7,000	7,000	8,000	59,000
Open Space	5,600	5,600	5,600	28,464	7,300
Parking Spaces	800	600	600	800	900
Floor Area Ratio	18.7	15.0	12.0	9.7	13.3
Towers	2	2	2	2	1
Tower Heights (ft.)	400,250	325,200	250,150	240,200	465
Floors	34	28	21	19	35
Columbia Street	Open	Open	Open	Closed	Closed
Essex Street	Existing	Existing	Existing	Widened	Widened

Each of the alternatives is described in the sections which follow.

Alternative 1: No Build

The No Build alternative assumes the continuation of existing uses and structure on both the Kingston-Bedford Street and Essex Street sites. The Kingston-Bedford Street site is occupied by a mechanical garage with a practical capacity of 550 cars. The Essex Street site is occupied by a 130-car parking lot. This alternative assumes that these uses will continue and that approved projects in the project site vicinity, yet to be built, will be constructed. It also assumes that Essex Street will not be widened and the basic existing street patterns in the area will remain the same. Figure III-2 presents the plan for the No Build option. This alternative is the baseline condition to which all build alternatives are compared.

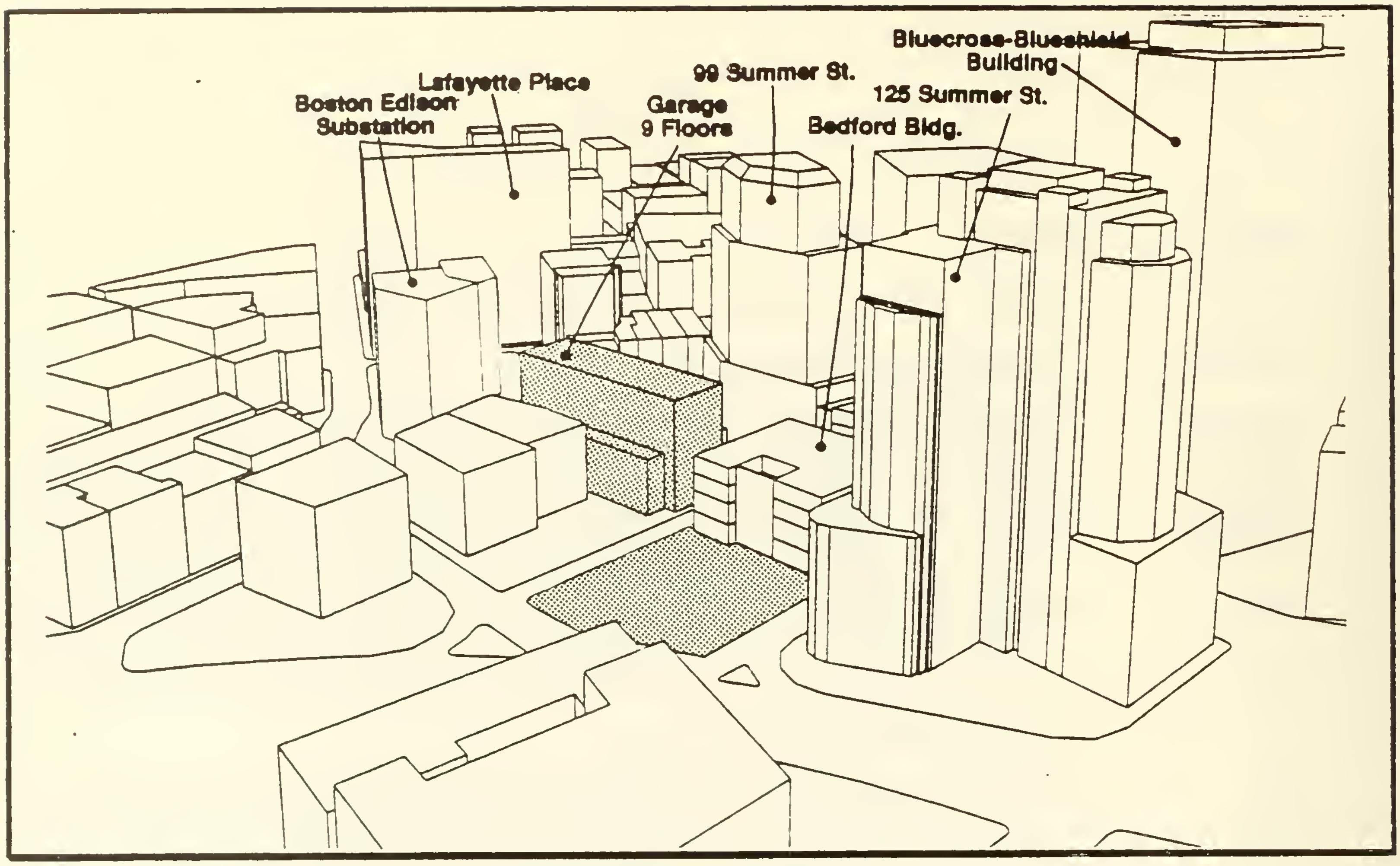
Alternative 2: 400 ft. Tower

Alternative 2 assumes that Bedford and Columbia Streets would continue to be used by vehicular traffic and that Essex Street would not be widened. It also assumes no acquisition of privately-owned sites or buildings. Figure III-3 indicates the proposed layout and conceptual design of structures on the site for this alternative.

The Kingston-Bedford Street garage site would accommodate a 400-foot high, 700,000 sq.ft. mixed-use office building. The ground level floorplate of this building would be 21,000 sq.ft. with 14,000 sq.ft. of retail space and 7,000 sq.ft. of lobby. There are 679,000 sq.ft. of office space that would be provided in the building and 5,600 sq.ft of open space provided on the site. The building would be divided into three-tiered sections with an 8-story building base set back 10 feet from the street, a middle section (floors 9 through 26) set back 5 feet from the base, and a top section (floors 26 through 33) set back 5 feet at an elevation of 310 feet.

The Essex Street site would accommodate a 250-foot high, 200,000 sq.ft. mixed-use retail/hotel complex with 300 rooms. The ground floorplate of this building would be 16,000 sq.ft. with 8,000 sq.ft devoted to retail space and 8,000 sq.ft. devoted to hotel lobby use. This building would be set back 10 feet from Lincoln, Essex, and Columbia Streets to allow for pedestrian movement around the building. The building mass would be divided into three-tiered sections that are stepped back at 15 foot increments. The building base would extend from floors 1 to 6, the shaft would extend from floors 7 to 25, and the top section would extend from floors 26 to 28.

An 800-car, 7-level below-grade parking garage located beneath both the Kingston-Bedford and Essex Street sites would be provided. Access to the garage would be provided from Lincoln Street, opposite the proposed 125 Summer Street garage driveway, and from the 99 Summer Street underground garage.



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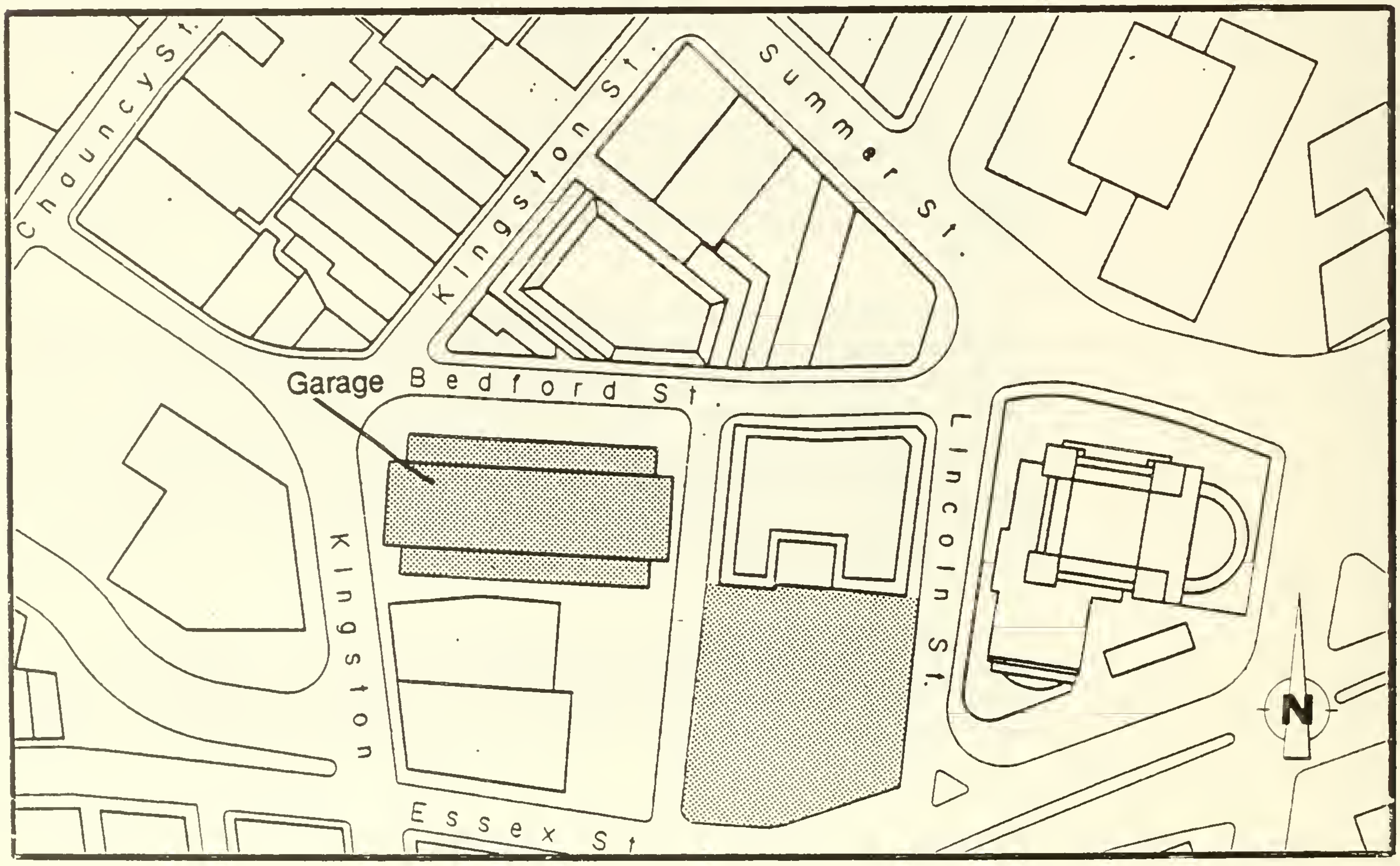
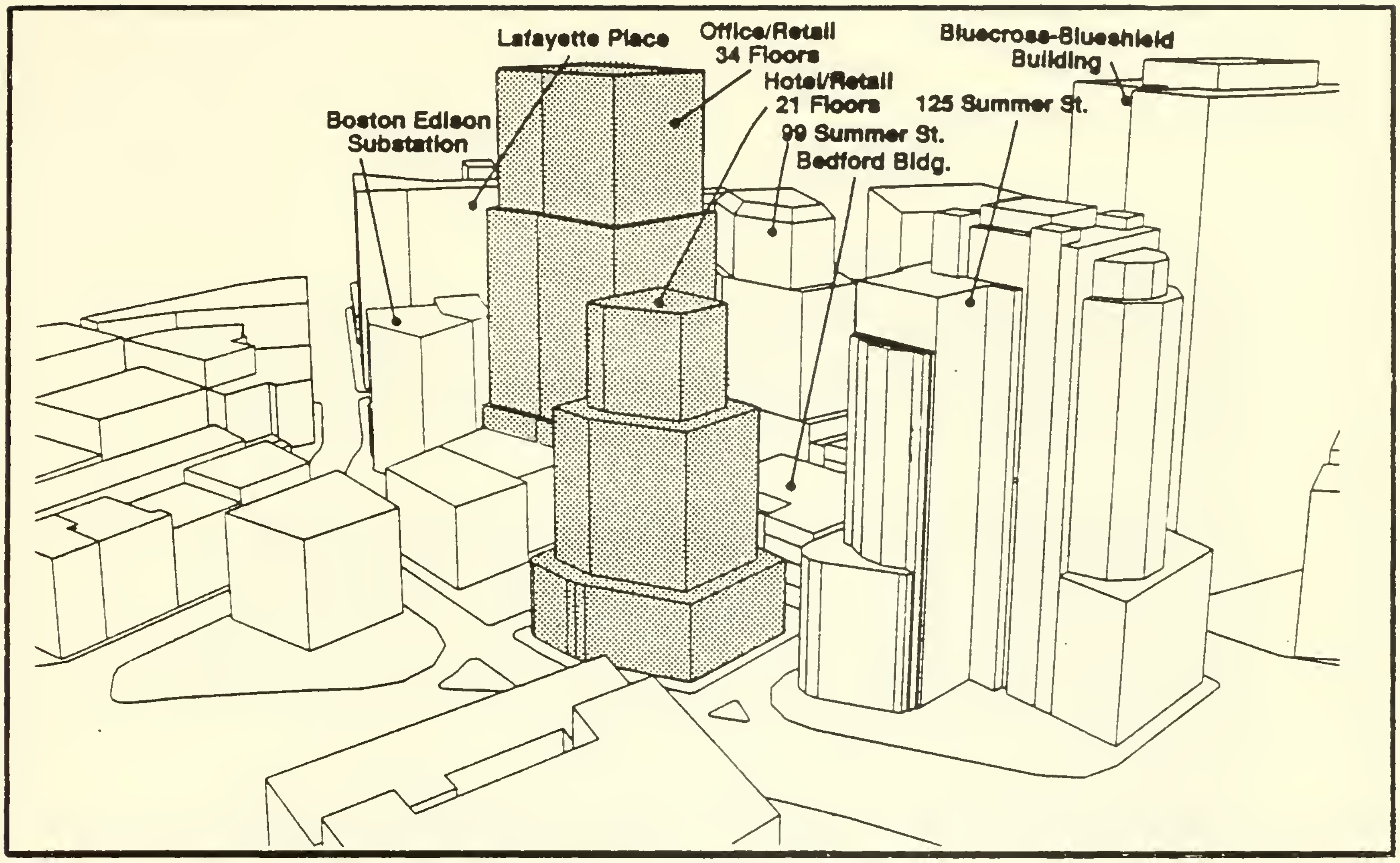


PLAN VIEW

Figure III-2:
Alternative 1: No Build



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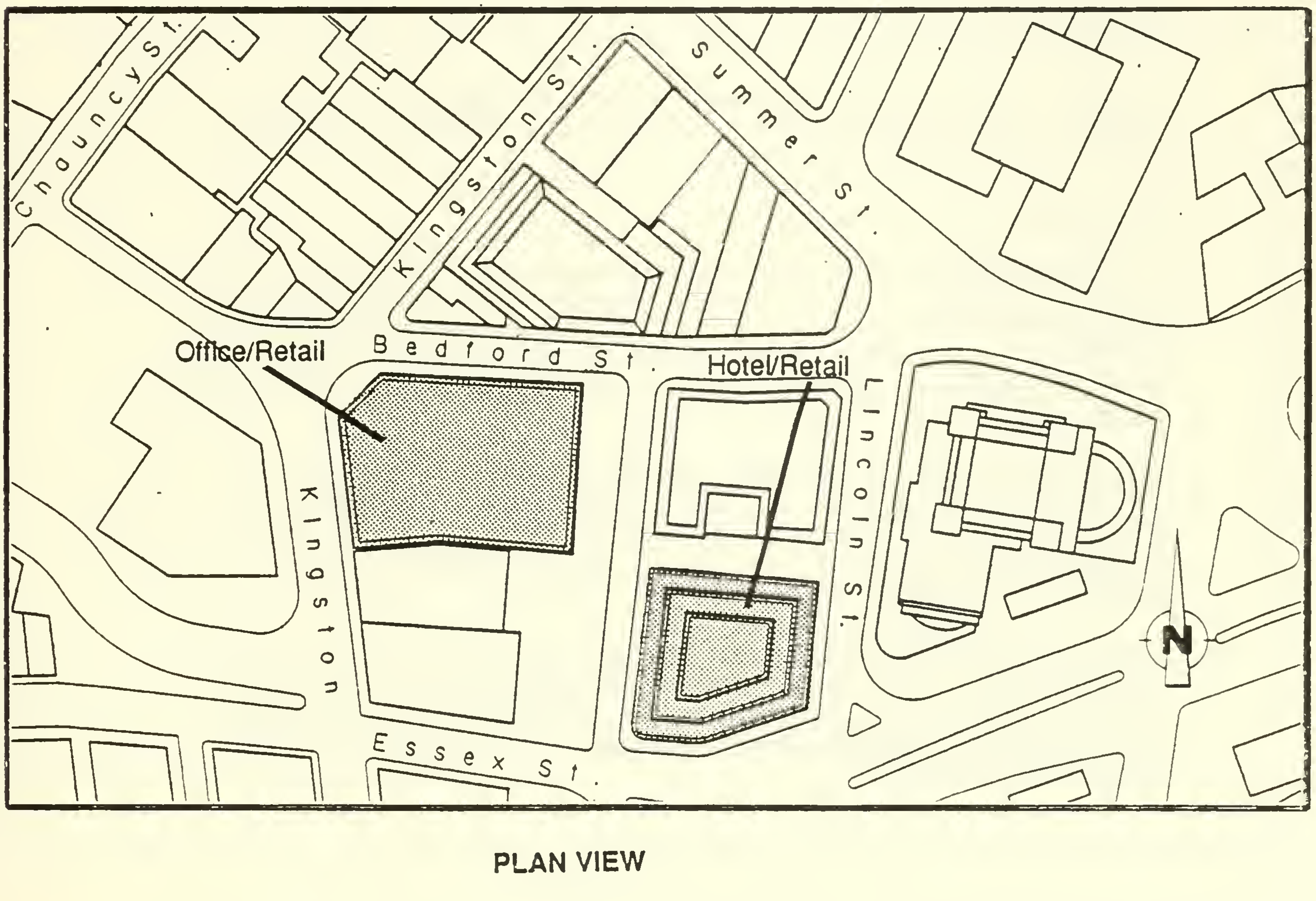


PLAN VIEW

Figure III-3:
Alternative 2: 400 ft. Tower

Alternative 3: 325 ft. Tower

This alternative assumes similar site conditions as Alternative 2 in terms of continued vehicular use of Bedford and Columbia Streets, Essex Street not being widened, and no acquisition of privately owned land. Figure III-4 indicates the proposed layout and conceptual design of structures on the site for this alternative.

The Kingston-Bedford Street garage site would be developed with a 325-foot high, 575,000 sq.ft. building. The ground floorplate of this building would be 21,000 sq.ft. with 14,000 sq.ft. of retail space and 7,000 sq.ft. of lobby space. Approximately 554,000 sq.ft. of office use would be provided in this building, and 5,600 sq.ft. of open space would be provided at the ground level. The building is divided into three-tiered sections that are stepped back at 5-foot increments. The building base would extend from floor 1 to 8, the shaft will extend from floors 9 to 26, and the top section would include floors 27 and 28.

The Essex Street lot would accommodate a 200-foot high, 150,000 sq.ft. mixed-use retail/hotel complex with 240 rooms. The ground floorplate of this building would be 16,000 sq.ft. with 12,000 sq.ft. devoted to retail use and 4,000 sq.ft. devoted to hotel lobby. The building would be set back 10 feet from Lincoln, Essex, and Columbia Streets to allow for pedestrian movement around the building. It would be divided into two-tiered sections. These tiered sections would be stepped back at 20-foot increments with the building base extending from floors 1 to 8, and the shaft extending from floors 9 to 28.

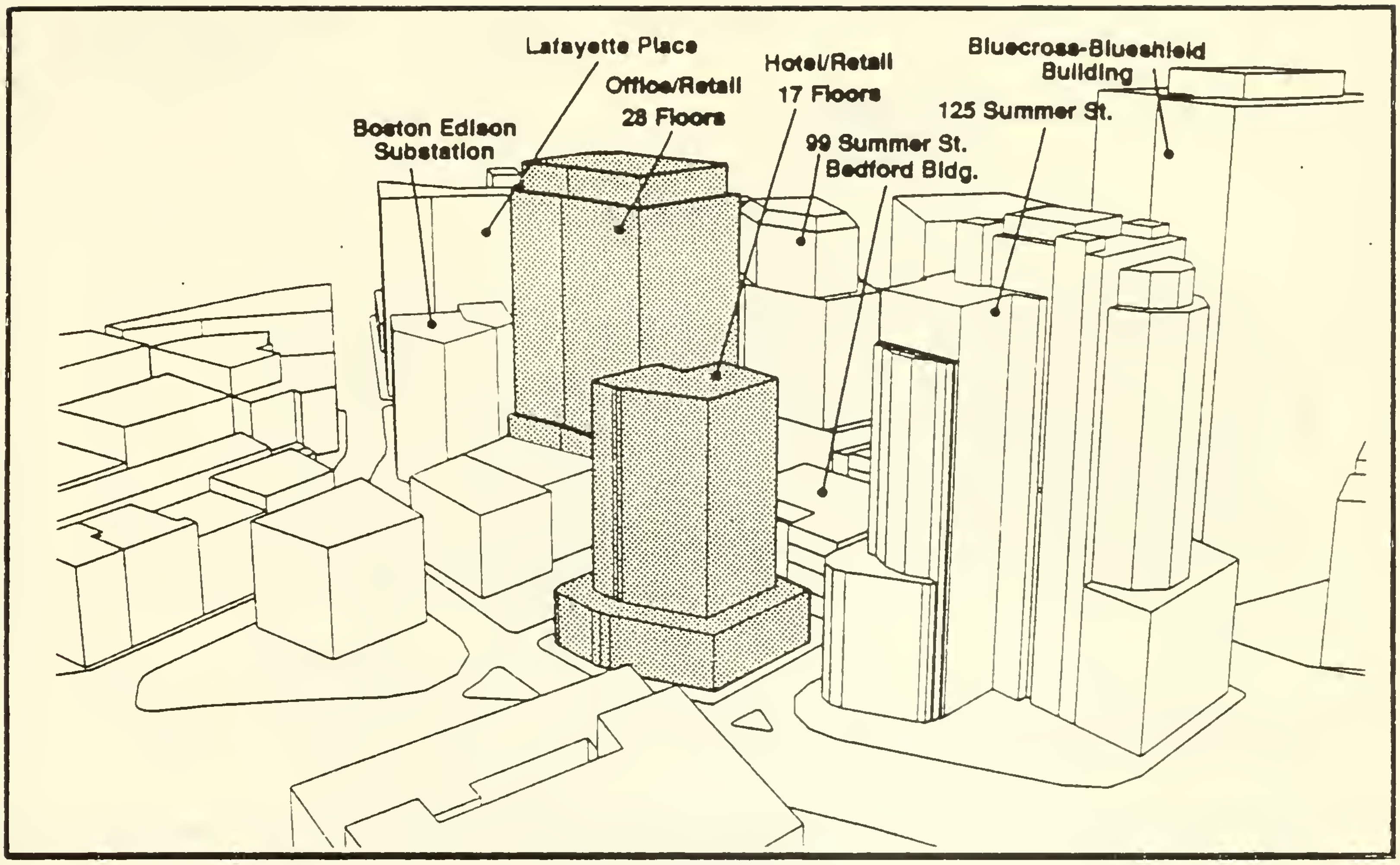
A 600-car underground parking garage for both sites would be provided in this alternative. Access to this garage would be from Lincoln Street and from the 99 Summer Street underground garage.

Alternative 4: 250 ft. Tower

This alternative assumes the same general site conditions as the previous two alternatives in terms of continued vehicular use of Bedford and Columbia Streets, Essex Street not being widened, and no acquisition of privately-owned land. It is different, however, in that it is the smallest of the build alternative. Figure III-5 indicates the proposed layout and conceptual design of structures on the site for this alternative.

The Kingston-Bedford Street site would be developed into a 250-foot high, 450,000 sq.ft. mixed-use office building. The ground floorplate of this building would be similar in size and use to Alternatives 2 and 3, with a total square footage of 21,000 sq.ft., of which 14,000 sq.ft. would be retail space and 7,000 sq.ft. would be a hotel lobby.

Approximately 429,000 sq.ft. of office use space would be provided in this building with 5,600 sq.ft. of outdoor open space at the ground level. The building would be divided into two-tiered sections that are defined by a 5-foot wide setback. The building base would extend from floors 1 to 8 and the shaft would extend from floors 9 to 21.



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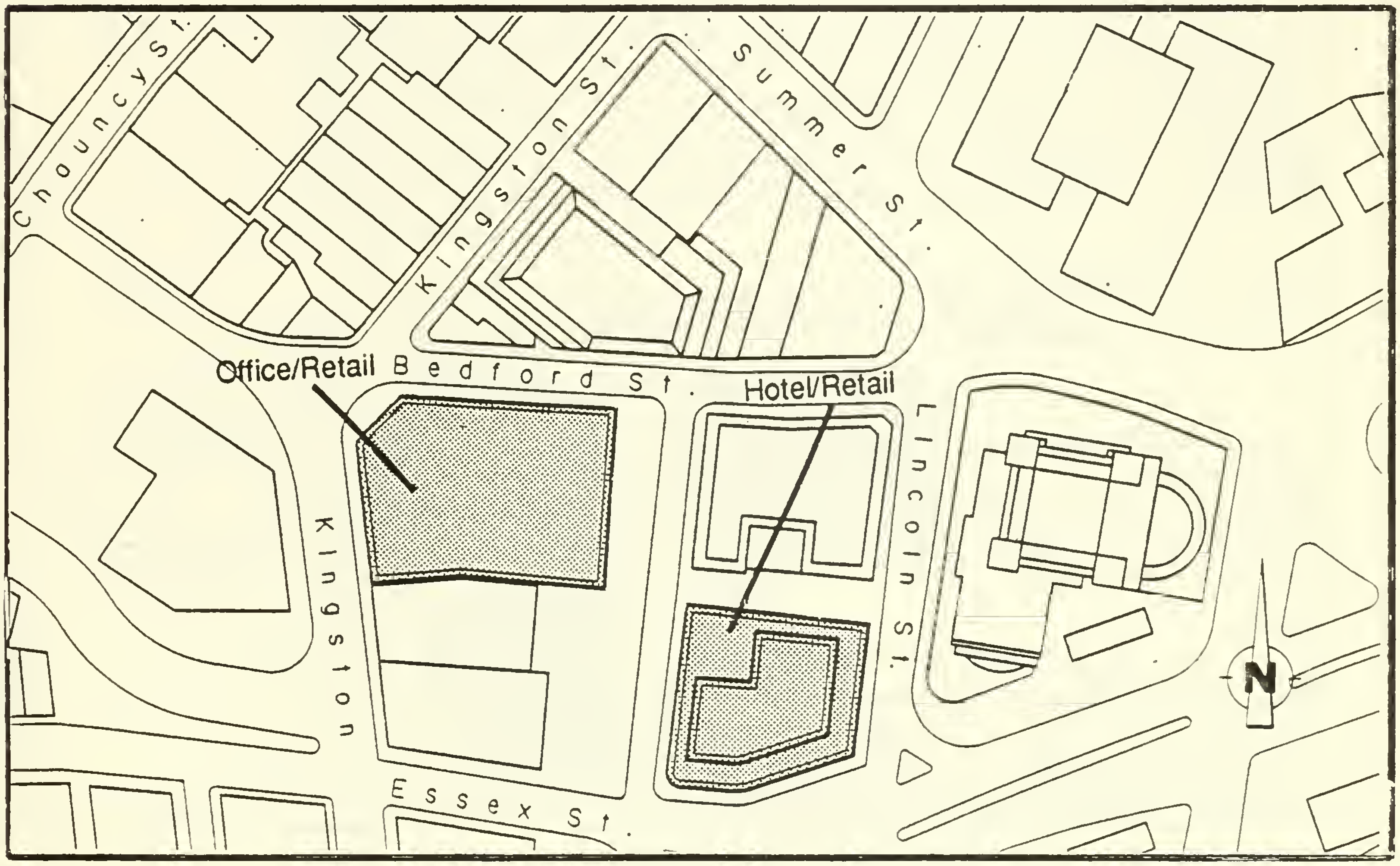
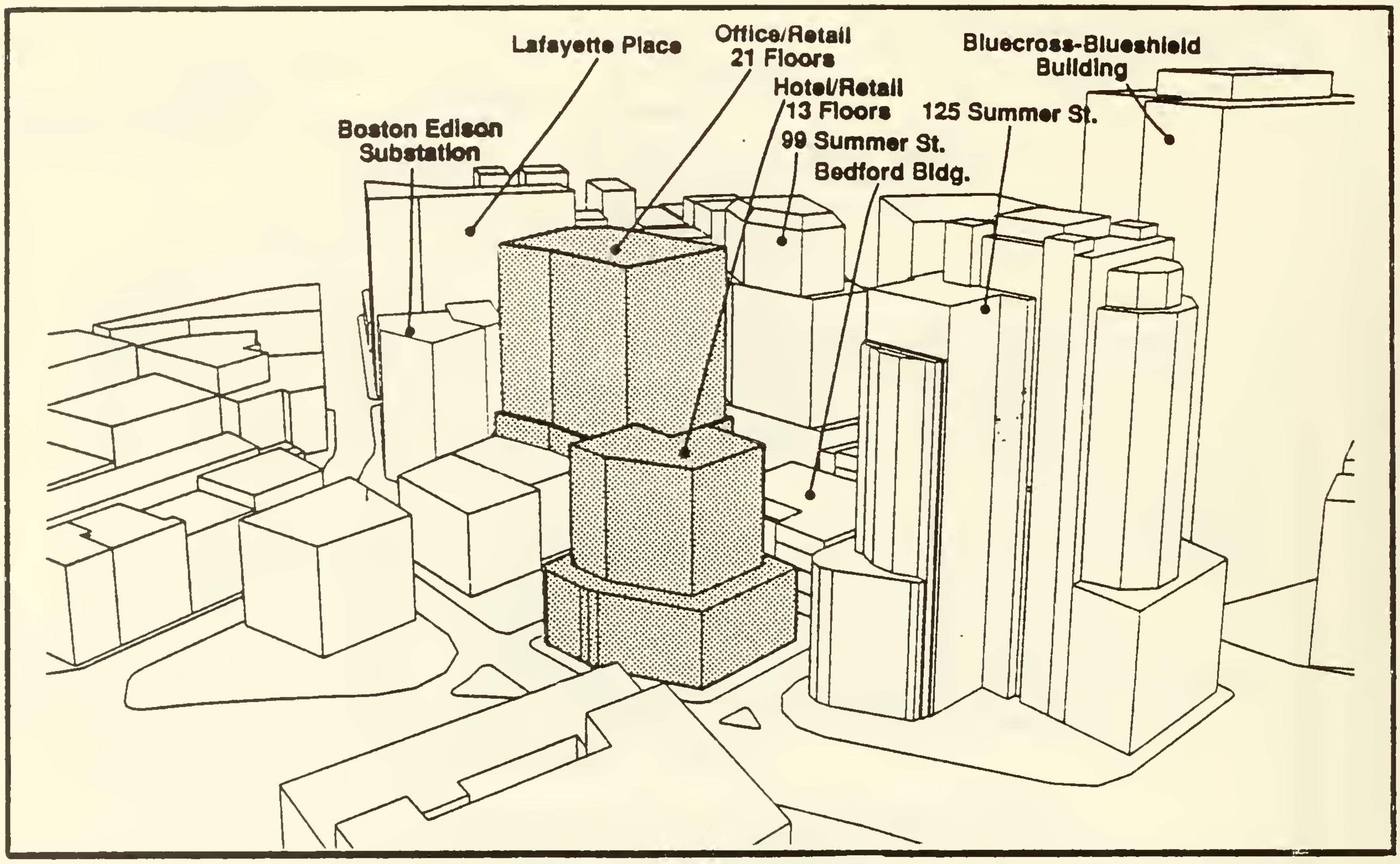


PLAN VIEW

Figure III-4:
Alternative 3: 325-ft. Tower



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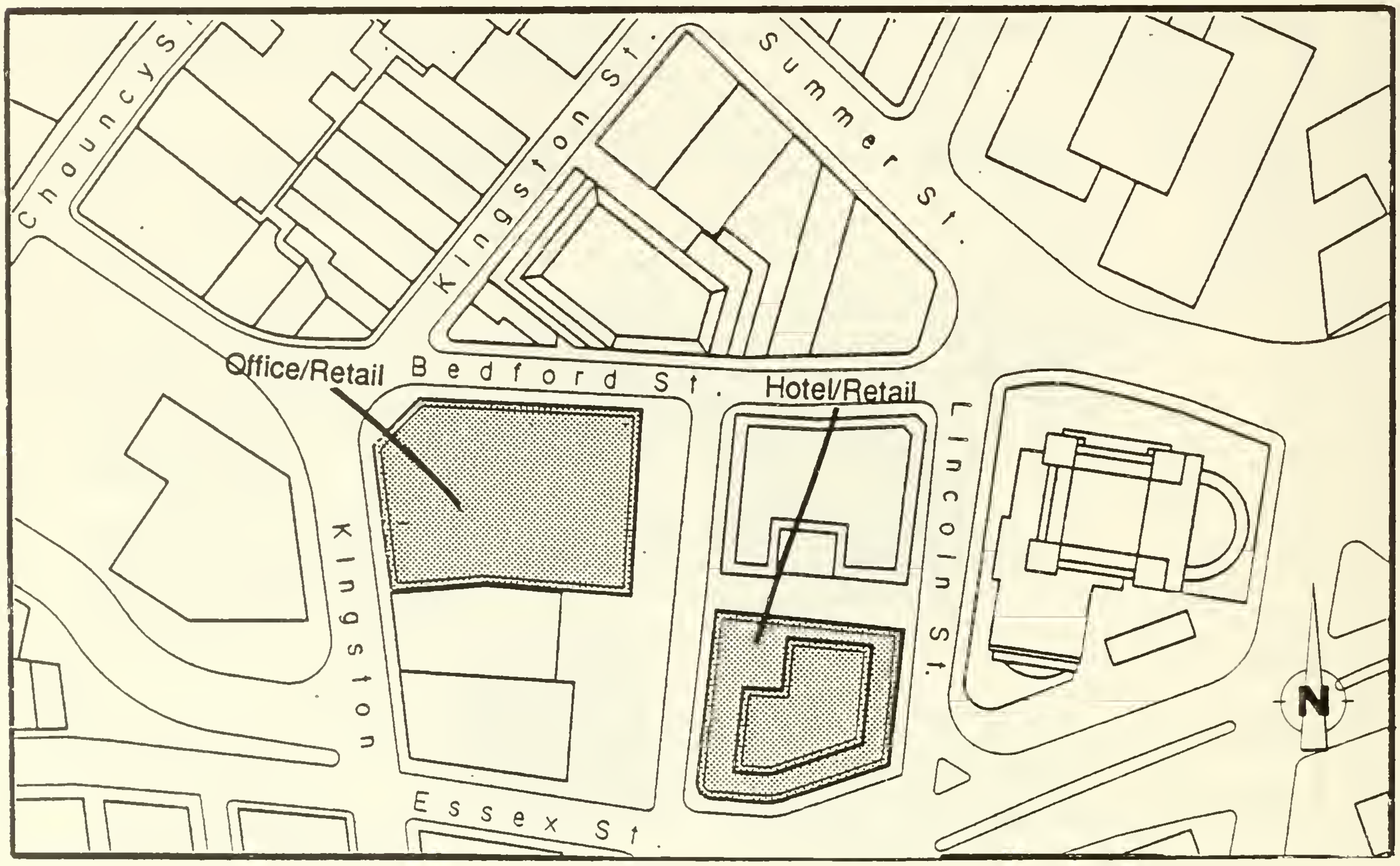


PLAN VIEW

Figure III-5:
lternative 4: 250 ft. Tower

The Essex Street lot would be developed into a 150-foot high, 130,000 sq.ft. mixed-use retail/hotel complex with 200 rooms. The ground level floorplate of this building would be 16,000 sq.ft. with 12,000 sq.ft. devoted to retail space and 4,000 sq.ft. devoted to hotel lobby. As with Alternatives 2 and 3, the building would be set back 10 feet from Lincoln, Essex, and Columbia Streets to allow for sidewalks around the building. It would be divided into two-tiered sections. The tower (floors 9 to 21) would be stepped back 15 feet from the building base which would extend from floors 1 to 8. This alternative, similar to Alternative 3, would have a 600-car below grade parking garage with entrances from Lincoln Street and the 99 Summer Street parking garage.

Alternative 5: Expanded Site

The basic concept for Alternative 5 is to expand the site, reduce the building heights, and increase the open space. It proposes a design concept that would include adjacent privately-owned parcels and Columbia Street. This alternative also proposes that Essex Street be widened.

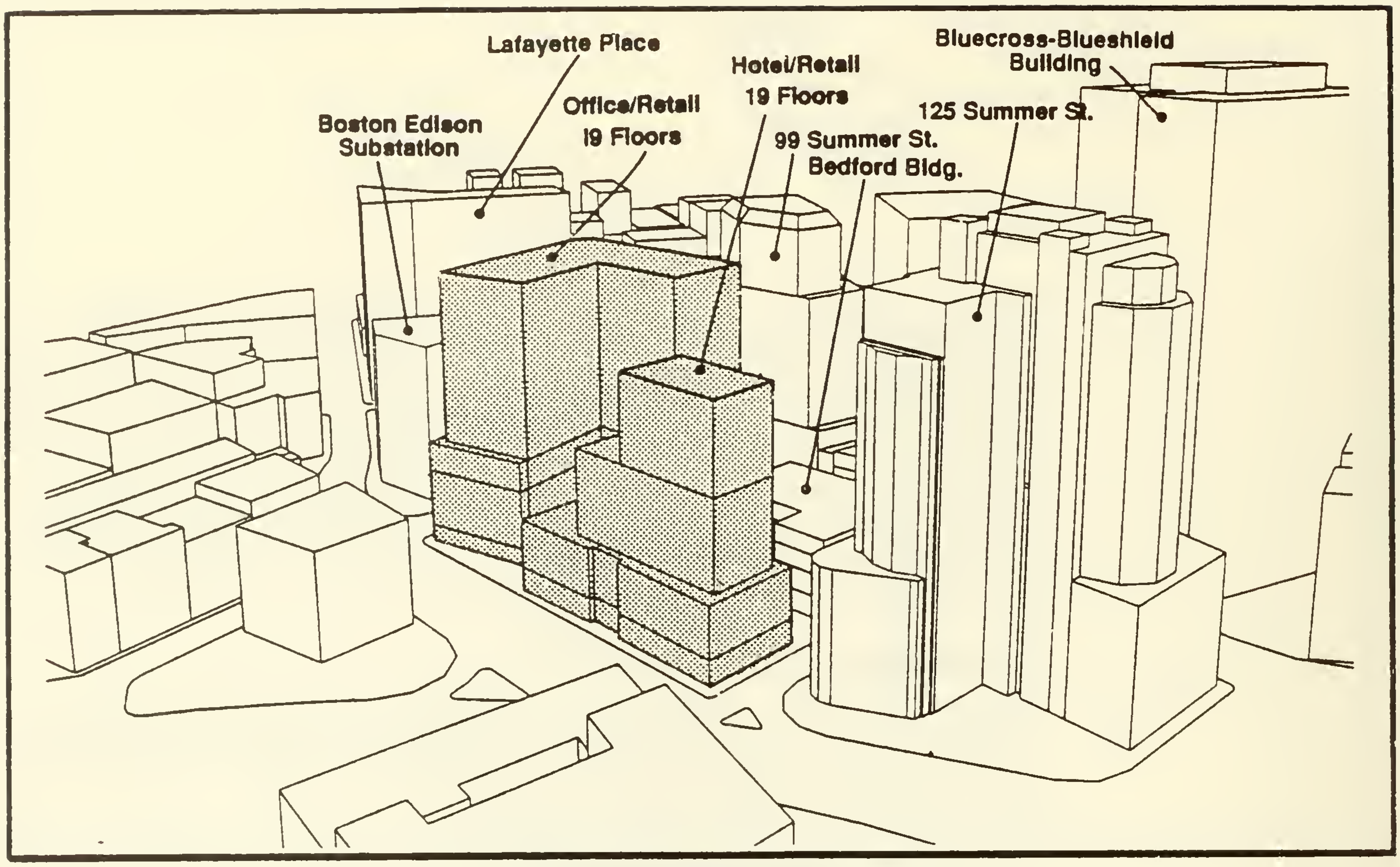
The building on the Kingston-Bedford Street block totals 540,000 sq.ft., of which 22,000 sq.ft. is retail space on the ground floor (with 8,000 sq.ft. for lobby) and 510,000 sq.ft. is office space. It has a height of 240 feet. In this alternative, the total ground floorplate would be 30,000 sq.ft. The Essex Street site accommodates a total of 190,000 sq.ft. with a 17,200 sq.ft. floorplate. With a height of 200 feet, it has a ground floor which would accommodate 8,000 sq.ft. of retail space. The upper floors would accommodate 182,000 sq.ft. of hotel space with 300 hotel rooms. Both the Kingston-Bedford Street and the Essex Street buildings would be setback from the surrounding streets and divided into three-tiered sections. The site is 75,664 sq.ft., of which 28,464 sq.ft. is open space. Figure III-6 indicates the proposed layout and conceptual design of structures on the site for this alternative.

A parking garage consisting of seven levels below grade with an 800-car capacity would be provided by this alternative. Access would be from Lincoln Street.

Alternative 6: Developer's Proposal

Alternative 6 is distinguished from the others in that it proposes a single tower, rather than two towers. This alternative occupies the entire site. Alternative 6 is based on the site configuration described for Alternative 5, for a total project site of approximately 75,664 sq.ft. At a total building area of 1,005,000 sq.ft., this alternative has the largest development program. However, the floor area ratio is 13.3, below that of Alternatives 2 and 3.

This alternative consists of a 35-story, 465 foot high, office building at the southeastern portion of the site. A slender tower sits above a 9-story, 130 ft. high base stepped back from the street at several levels. The base would contain office space, retail spaces on two levels, and an eight story, second-floor public atrium centered on restaurant and retail space. An 900-car garage would serve both public and tenant parking needs on five below-grade levels with access from Kingston and Lincoln Streets. A public plaza on the corner of Essex and Kingston Streets faces the Chinatown community. The building would be entered from this plaza as well as from entry points at the Essex/Lincoln Street corner, mid-block on Lincoln Street, at the end of a landscaped Columbia Street plaza, and at the Kingston/Bedford Street corner. An interior 5-bay loading dock at mezzanine



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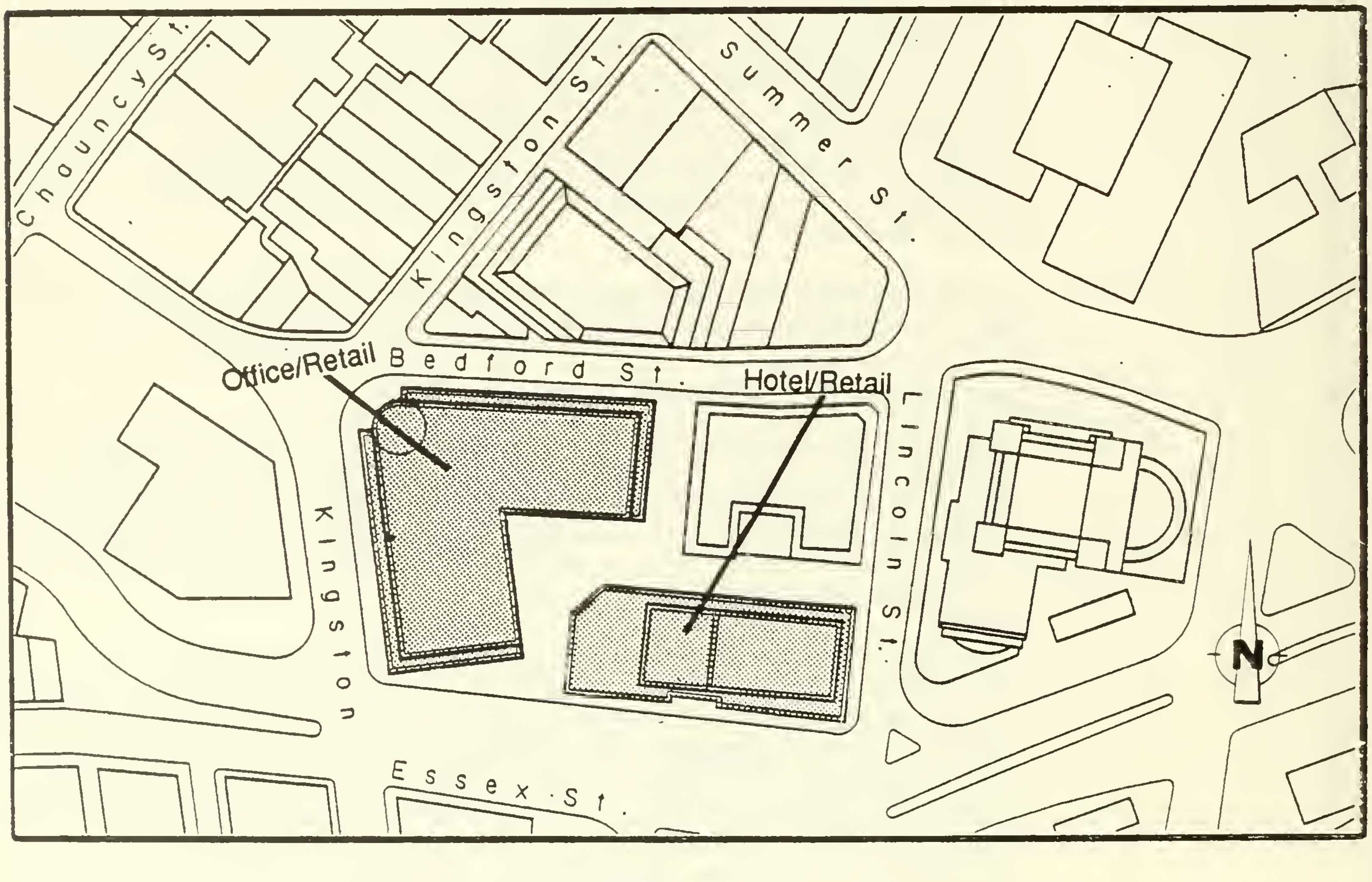
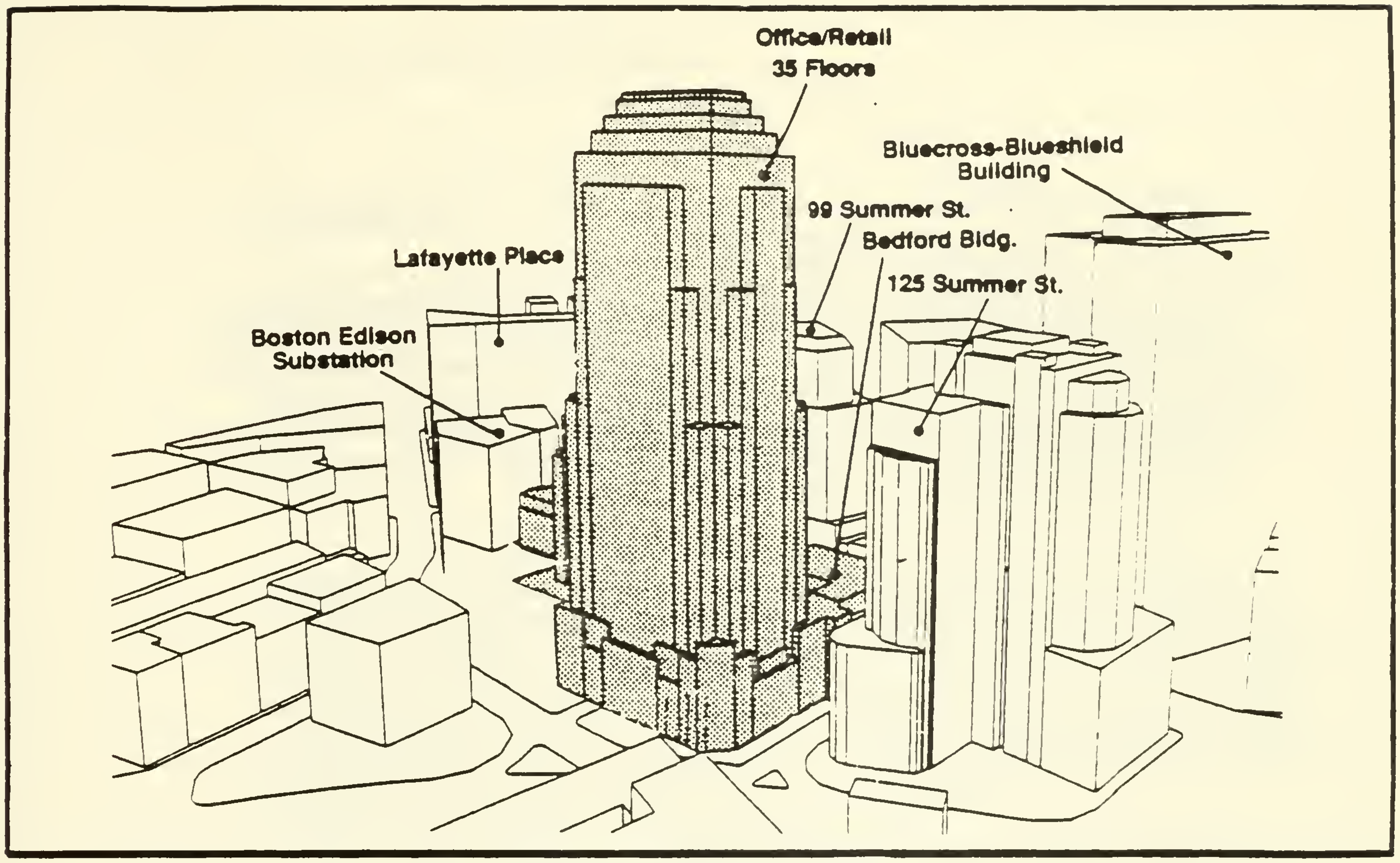


PLAN VIEW

Figure III-6:
Alternative 5: Expanded Site



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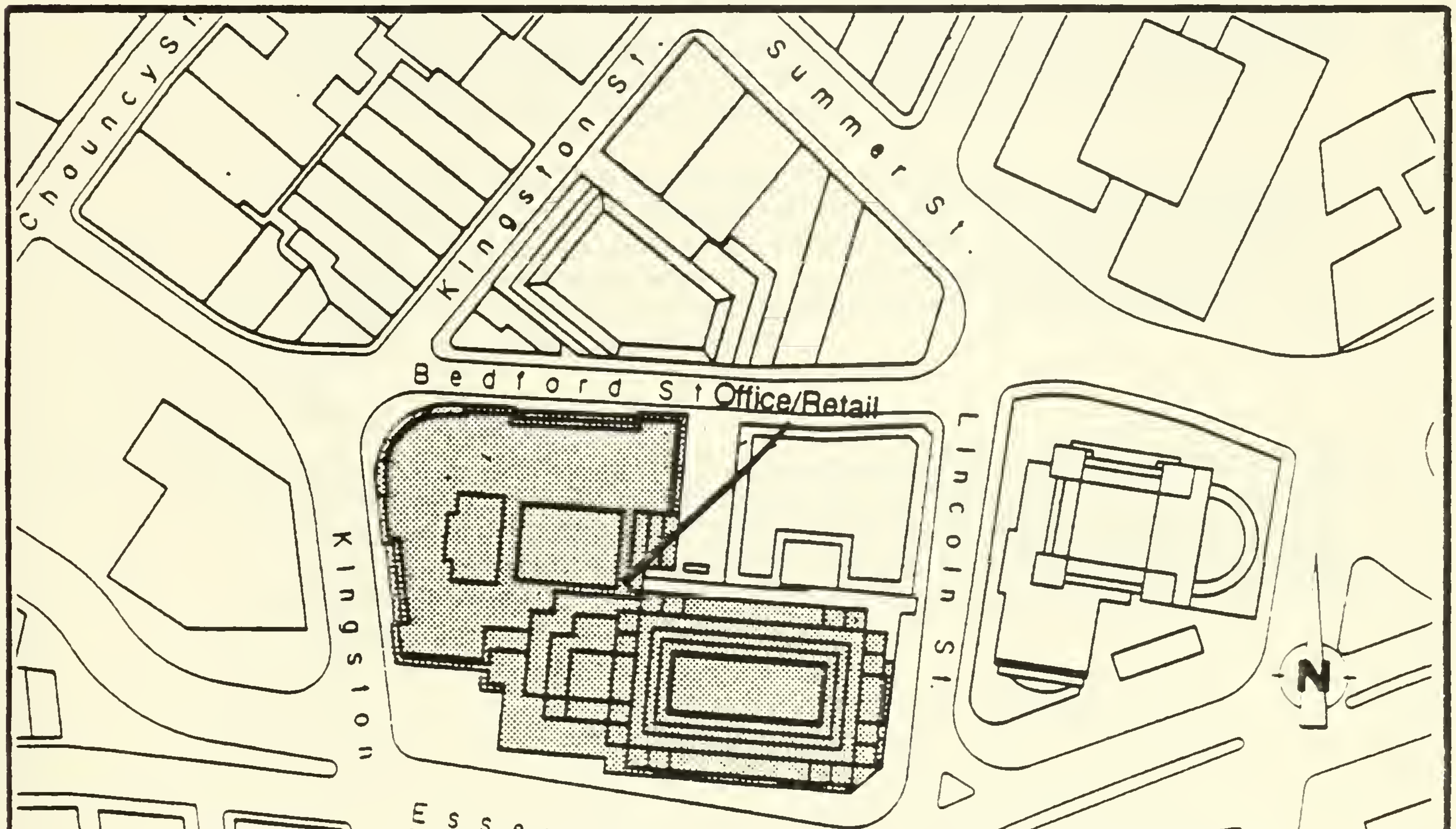


PLAN VIEW

Figure III-7:
Alternative 6: Developer's Proposal

level would be accessed via a ramp from Kingston Street, and would provide a direct connection to the service elevators.

This concept would result in traffic patterns on adjacent surface streets similar to those in Alternative 5, and would require the discontinuation of Columbia Street, the southern half of which would be incorporated into the project site. As in Alternative 5, the private land on the southern half of the Kingston-Bedford Street would be added to the two City-owned parcels. The widening of Essex Street is also assumed in this alternative, as in Alternative 5. Figure III-7 depicts the layout and conceptual design of Alternative 6.

IV. Environmental Issues

A. Transportation

Introduction

From a transportation perspective, the proposal to redevelop the Kingston-Bedford-Essex Street site presents both environmental questions and opportunities. Its location is almost ideal with respect to transit, due to the closeness of the Downtown Crossing MBTA Station, as well as South Station with its concentration of rapid transit, railroad, and bus services. The site's roadway access is also convenient to the major highway system, as access to the Central Artery (I-93) and Massachusetts Turnpike (I-90) is close at hand, without long travel distances on local streets.

The Kingston-Bedford-Essex Street development also is replacing parking facilities which in their present configuration represent a less than optimal use of land. A free-standing garage and lot will be replaced with mixed use activities which will add life to the street level and immediate area, while placing the parking underground and out of sight. This is following a trend in Boston where a number of parking facilities have been recycled into more active uses, while continuing to supply parking. These new developments include 75 State Street, Rowe's Wharf, 500 Boylston Street, and International Place. Each of these has attempted to add vitality, economic value, and amenities to the Downtown.

With this positive backdrop, however, some serious matters must be probed. The site is located in an area of Downtown perceived by many as experiencing unacceptable traffic congestion, limited parking, and poor pedestrian access. Local access streets, albeit close to the express highways, are complex and circuitous, and must serve the adjacent community of Chinatown, pedestrians, and other development, existing and proposed. The Kingston-Bedford-Essex Street project will displace existing parking and provide new parking which, as will be seen, mostly meets its own demand when viewed under existing circumstances.

The basic task of assessing and analyzing impacts is to see how traffic operations, parking supply and demand, and aspects of transit use and pedestrian service are met, given established travel mode usage. The approach utilized to examine the development impacts on transportation facilities follows the MEPA guidelines for assessment of environmental impacts and the production of the required Environmental Impact Report.

Study Methodology

The first step was to examine existing transportation conditions within the defined study area. Further analysis examines the expected transportation conditions for the defined future study year (1993), without the development (No Build Conditions). Development impacts are then analyzed for the most critical development alternative. Five alternatives have been developed for consideration in this DEIR, as follows:

Alternatives	LAND USE Office (sq. ft.)	Retail (sq. ft.)	Hotel (rooms)	Parking Spaces
1: 400 ft. Tower	679,000	22,000	300	800
2: 325 ft. Tower	554,000	26,000	240	600
3: 250 ft. Tower	429,000	26,000	200	600
4: Expanded Site	510,000	30,000	300	800
5: Developer's Proposal	892,000	54,000	0	900

The most critical of these with respect to transportation impacts is the 400 ft. Tower alternative. Since the other alternatives do not produce a substantial difference in transportation impacts, they are examined only in relative terms to the critical development alternative.

Transportation mitigation measures also are analyzed for the most critical development scenario and therefore will accommodate the alternatives that produce lesser impacts. The transportation mitigation measures suggested include improvements to the study area roadway and intersection network, and transit and ridesharing incentives.

In undertaking these analyses, care has been taken to see that the effects of other planned developments, with their own additional access demands, are taken into account. In addition, assumptions were made with respect to the future available street network. These assumptions are set forth in the appropriate sections. Summarized, major goals of the analysis were:

- to channel traffic away from purely local streets;
- to avoid reliance on roadway changes which remain in planning stages and which may not be built; and
- to avoid reliance on existing street features which are subject to elimination.

Description of the Environment

Current traffic flow conditions and data on public transportation and pedestrian activity were obtained by reviewing available information and reports, conducting an engineering reconnaissance of the affected roadway and public transportation facilities, and analyzing traffic volume data for key roadway segments and intersections.

Vehicular Access

The boundaries of the traffic impact study area were defined by those street segments which will be directly affected by site-generated traffic. The roadway network as defined for the study area is identified in Figure IV A-1. The general limits of the area are: Summer Street to the north, Kneeland Street to the south, the Surface Artery to the east; and Washington Street to the west. Traffic operations were analyzed at the following intersection locations within this area:

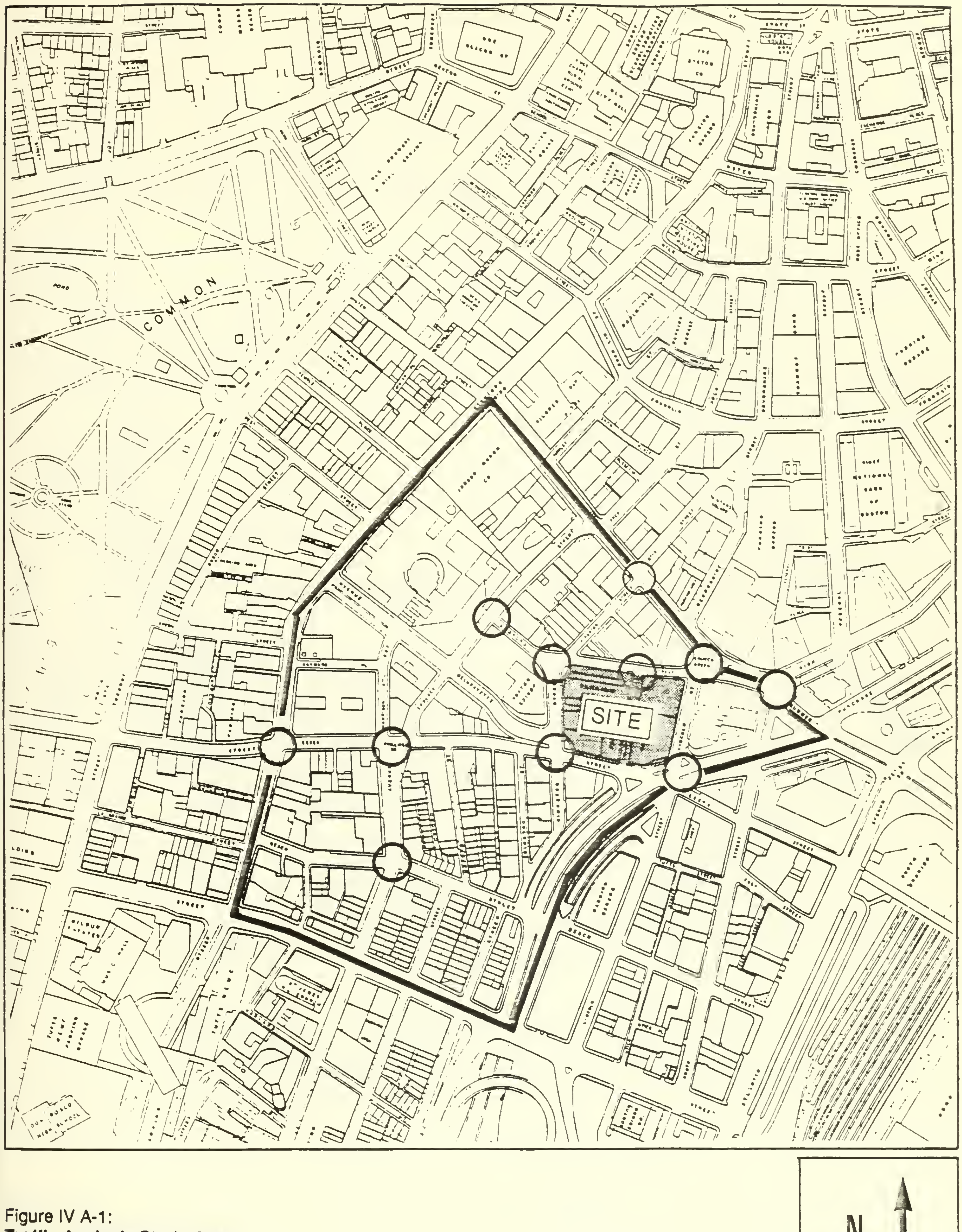


Figure IV A-1:
Traffic Analysis Study Area

- Summer-High-South;
- Summer-Lincoln-Bedford;
- Summer-Otis-Kingston;
- Bedford-Columbia;
- Bedford-Kingston;
- Bedford-Chauncy-Lafayette Place Garage;
- Surface Artery-Essex-Lincoln;
- Essex-Kingston-Avenue de Lafayette;
- Essex-Harrison-Chauncy;
- Essex-Washington; and
- Harrison-Beach.

Although other streets in the surrounding area will be used by a portion of the anticipated site traffic, the impact of these lower volumes will be negligible.

Study Area Regional Access

Regional access to the Kingston-Bedford-Essex Street site is provided by the Massachusetts Turnpike (I- 90) and the John F. Fitzgerald Expressway [I-93, (Central Artery, Southeast Expressway)]. Arterial streets which provide access from these major highways include Lincoln Street, South Street, and Atlantic Avenue from the south, the Surface Artery from the north and south, Summer Street from the east, and Essex Street from the west. Much of the roadway network in the study area is designated as one-way streets. Figure IV A-2 depicts the study area traffic circulation patterns and the associated traffic control devices at intersections.

For access from I-90 and from I-93 south of the site, the most direct connection to the surface street system is via the ramps at the I-90/I-93 interchange. The off-ramp from I-90 leads to the Kneeland Street/Atlantic Avenue intersection. The I-93 off-ramp intersects Kneeland Street at Lincoln Street. Both off-ramps are located approximately 1/4 mile south of the site. Access from I-93 north of the site is via the off-ramp to Purchase Street/Summer Street or further north at the High Street off-ramp.

The on-ramps for I-90 and I-93 also are located within a short distance of the site. An on-ramp located southwest of the site at the Kneeland Street/Surface Artery intersection serves traffic accessing I-90 westbound and I-93 southbound. The I-93 northbound on-ramp is located approximately 300 feet east of the site along the Surface Artery at South Street.

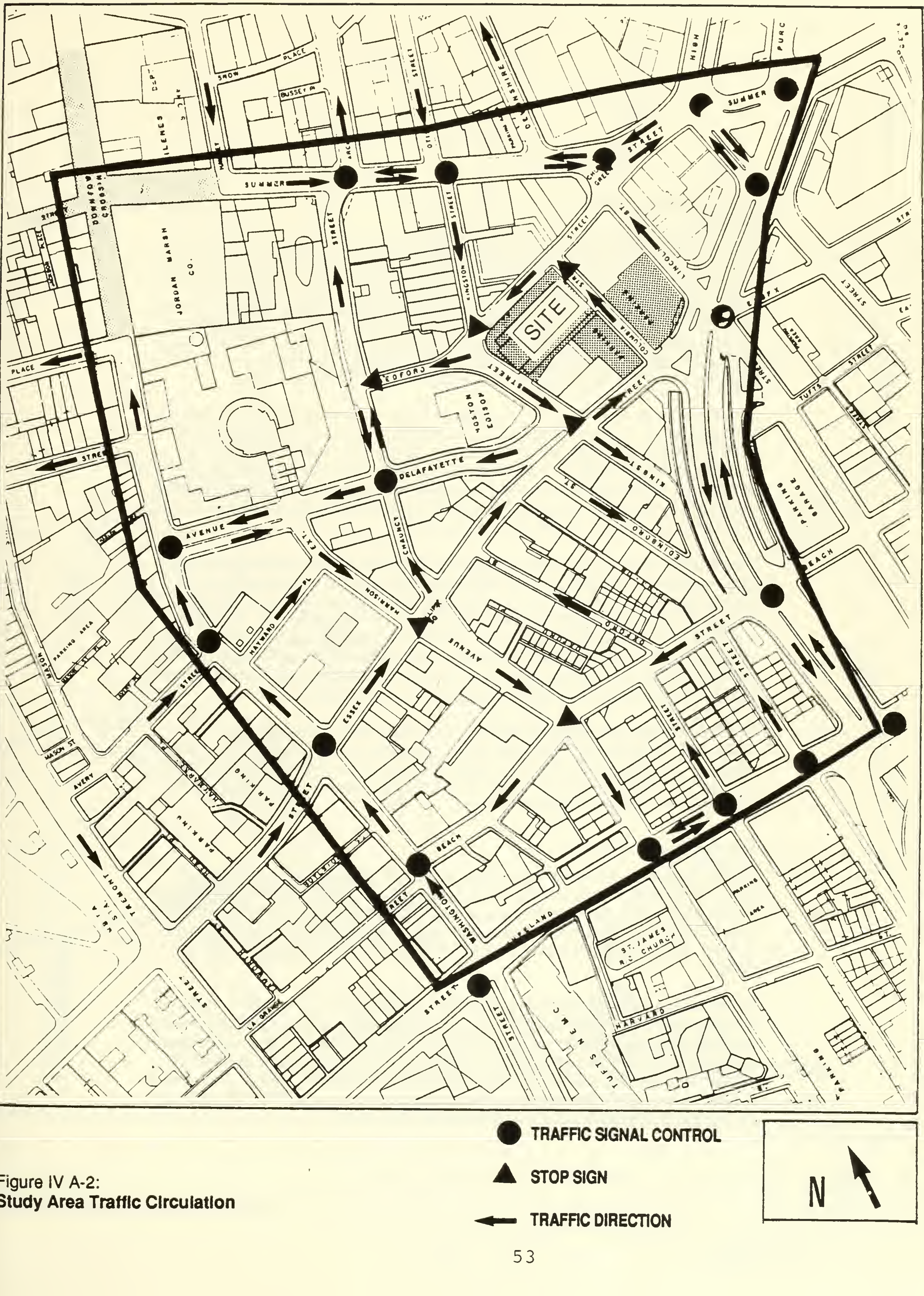


Figure IV A-2:
Study Area Traffic Circulation

Existing Traffic Volumes

Traffic volume data were obtained from daily and peak hour turning movement counts recorded by WCH Industries for this DEIR in 1986. Results were compared with more recent traffic counts conducted by the City of Boston Transportation Department and with information in the following reports: Draft Dewey Square Comprehensive Transportation Systems Management Program (Boston Redevelopment Authority, 1984), Transportation Impact Study and Access Plan, 125 Summer Street Development (Vanasse/Hangen Associates, 1986), the Commonwealth Center Transportation Impact Study (Sasaki Associates, 1988) and the Midtown Cultural District Plan (transportation elements), TAMS, 1988.

Existing average daily traffic (ADT) volumes on study area roadways are indicated in Figure IV A-3. Daily volumes were recorded by Automatic Traffic Recorders (ATR's) placed on various street segments. A summary of these counts is provided in Appendix B-1. Daily traffic volume estimates were developed for other street segments by multiplying the peak hour approach volume at selected intersections along the street by the ratio of the recorded daily volume to the peak hour approach volume for the intersecting street.

Hourly traffic data at study area intersection locations for the morning and evening weekday peak hours and the Saturday peak hour were obtained from manual turning movement counts. Volumes were recorded every 15 minutes. Results of these counts are shown in Figures IV A-4 through IV A-6. A tabular summary is provided in Appendix B-2. It was not necessary to balance the intersection counts in this complex downtown network for purposes of traffic capacity analysis; rather, the highest peak hour for each intersection was derived from the fifteen minute volume summaries to represent a worst case condition.

The data indicate the weekday morning peak hour traffic generally occurs between 8:00 and 9:00 AM. The peak hour of weekday evening traffic varies widely, although all intersections recorded peak volumes within the 4:00 and 6:00 PM time period. The peak hour of traffic on a Saturday generally occurs during the early afternoon period between 1:45 and 2:45 PM.

Existing Traffic Operations

Traffic operations are analyzed in terms of level of service (LOS) during these peak hour traffic periods at intersection locations. The capacity of an intersection or roadway facility is the maximum number of vehicles which can be reasonably expected to traverse a roadway segment and/or intersection approach during a specific time period, given the physical and operational characteristics of the facility.

Level of service for signalized intersections is defined in terms of delay. Level of service criteria for signalized intersections are quantified according to the average stopped delay per vehicle over a 15 minute analysis period. Another indication of the operational LOS is a comparison between the intersection capacity and the actual traffic volumes using (or expected to use) the roadway facility. The relationship between approach delays, volume-to-capacity ratios and LOS designations for signalized intersections is summarized in Table IV A-1.

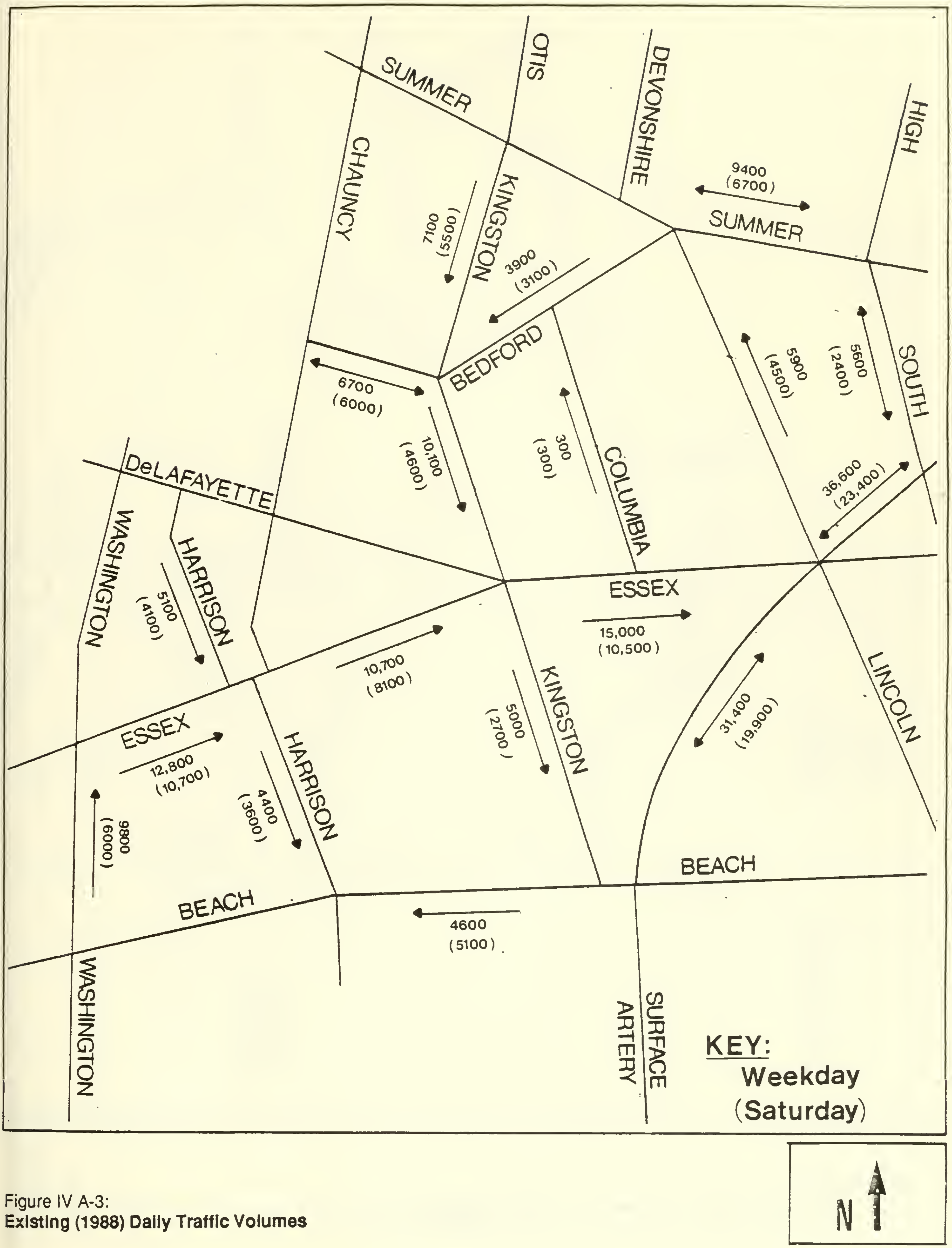


Figure IV A-3:
Existing (1988) Daily Traffic Volumes

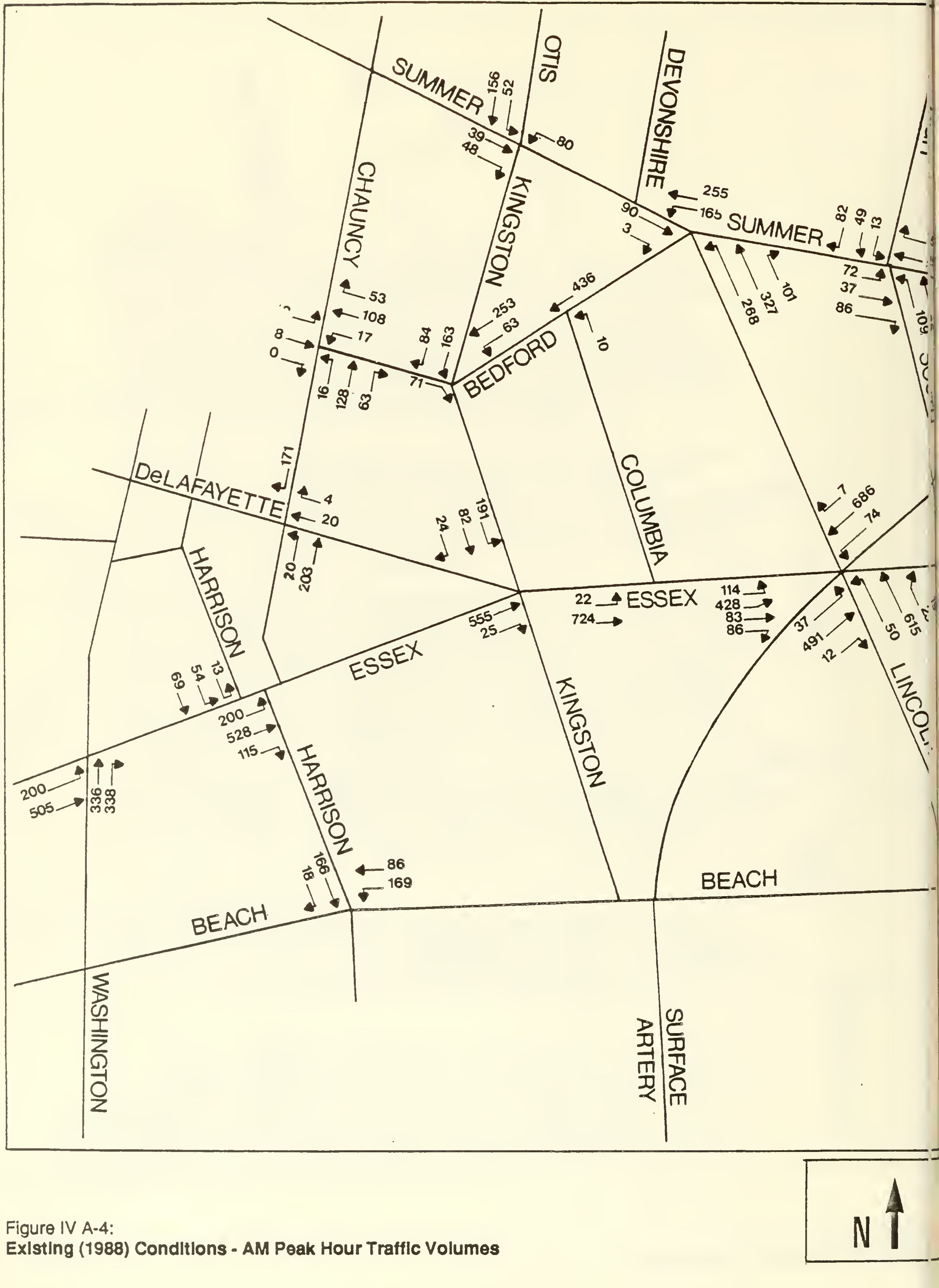


Figure IV A-4:
Existing (1988) Conditions - AM Peak Hour Traffic Volumes

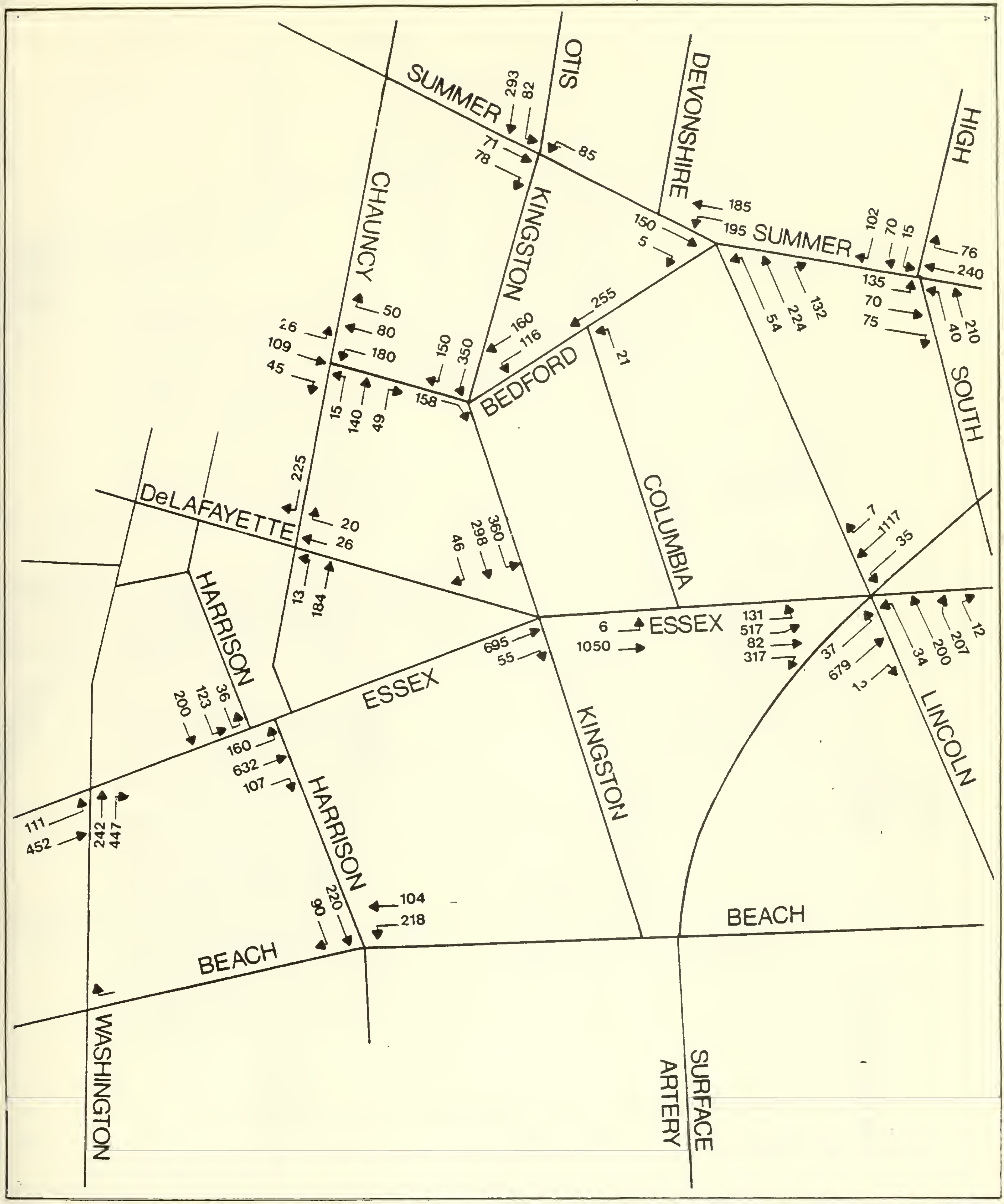


Figure IV A-5:
Existing (1988) Conditions - PM Peak Hour Traffic Volumes

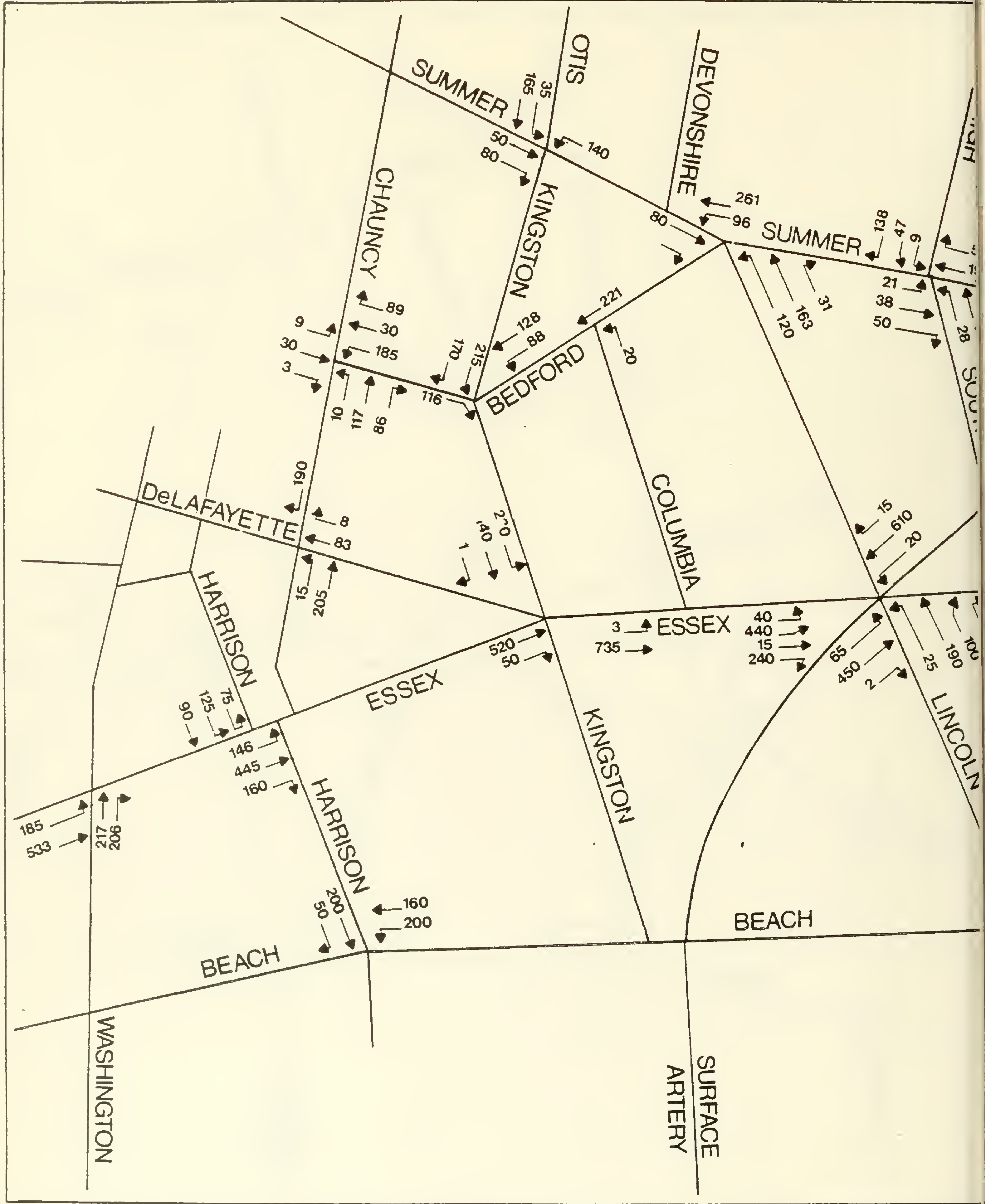


Figure IV A-6:
Existing (1988) Conditions - Saturday Peak Hour Traffic Volumes

TABLE IV A-1

Intersection Level of Service (LOS) Designations (1)

Level of Service	Description	Delay Range (2) Seconds per vehicle	Reserve Capacity (3) (Vehicles per Hour)
LOS A	Describes a condition of free flow, with low volumes and relatively high speeds. There is little or no reduction in maneuverability due to the presence of other vehicles, and drivers can maintain their desired speeds with little or no delay.	0.00-5.0	400
LOS B	Describes a condition of stable flow, with desired operating speeds relatively unaffected, but with a slight deterioration of maneuverability within the traffic stream.	5.1-15.0	300-399
LOS C	Describes a condition still representing stable flow, but speeds and maneuverability begin to be restricted. The general level of comfort begins to deteriorate noticeably at this level.	15.1-25.0	200-299
LOS D	Describes a high-density traffic condition approaching unstable flow. Speeds and maneuverability become more seriously restricted, and the driver experiences a poor level of comfort.	25.1-40.0	100-199
LOS E	Represents conditions at or near the capacity of the facility. Flow is usually unstable, and freedom to maneuver within the traffic stream becomes extremely difficult.	40.1-60.0	0-99
LOS F	Describes forced-flow or breakdown conditions with queueing along critical approaches. Operating conditions are highly unstable as characterized by erratic vehicle movements along each approach.	60.1 or greater	NA

---

(1) Source: Transportation Research Board, Highway Capacity Manual, Special Report 209, National Research Council, 1985

(2) Delay ranges relate to the mean stopped delay incurred by all vehicles entering the intersection for the movement or movements under consideration and do not consider the effects of traffic signal coordination. This criterion is intended for use in the evaluation of signalized intersections.

(3) Reserve capacity refers to the unused capacity of the minor approach, on a per lane basis. This criterion is limited to use in the evaluation of unsignalized intersections.

Level of service criteria for unsignalized intersections are defined by the reserve, or unused, capacity of the minor (i.e., controlled) approach. The analysis of unsignalized intersections is based primarily on the ability of vehicles along the minor approach to cross or turn through the traffic stream along the major approaches. This analysis procedure requires that the intersection right-of-way be clearly defined, resulting in a situation where drivers on the minor street must use judgment to select acceptable gaps in the major street flow through which to execute turning maneuvers. Therefore, the capacity of a controlled approach is dependent on two factors, as follows:

1) the distribution of gaps in the traffic stream along the major street; and

2) driver judgment in selecting gaps in the major stream through which to execute turning movements.

The volume using the major intersection approaches is a governing factor in the capacity determination for the minor approach. The reserve capacity at the minor approach is subsequently determined by calculating the difference between the capacity of the intersection at LOS F and the actual approach volume, adjusted to account for traffic stream characteristics and intersection geometrics. Reserve capacity is usually defined on a per lane basis for a peak hour analysis period.

From a traffic operations standpoint, LOS C or better is generally considered an acceptable condition. LOS D may also be acceptable in urban conditions. LOS D represents conditions where the peak hour demands are less than the capacity of the roadway or intersection, but where speeds are considerably reduced and delays increased. LOS E represents operations at or near capacity where delays to critical approaches are significant.

Table IV A-2 shows existing traffic operations at study area intersections for weekday morning, weekday evening, and Saturday afternoon peak hours. All traffic operations analyses were conducted assuming full enforcement of existing traffic and parking regulations along study area streets. Although current lack of parking restriction enforcement measures, such as tow zones, produces poorer traffic operations than those indicated in the analyses, the results are used for comparative purposes with the No Build and 400 ft. Tower Alternatives where these restrictions are assumed to be fully enforced. The operations analyses are provided in Appendix B-3.

The analyses indicate traffic operations at study area intersections to be at acceptable levels of service (LOS D or better) during the morning peak hour period. The intersection of Essex-Harrison-Chauncy is the only location during the morning peak hour which operates at LOS D; all other locations operate at LOS C or better.

Traffic operations during the evening peak hour period, however, are decidedly worse, especially for unsignalized locations along the Essex Street corridor. The Essex-Harrison-Chauncy Street intersection operates at LOS D for southbound vehicles along Harrison Avenue approaching Essex Street. This location also operates poorly (LOS F) during the Saturday peak hour period. The Essex-Kingston-Avenue de Lafayette intersection operates at LOS F for southbound left turns from Kingston Street to Essex Street, while through movements operate at LOS D. The Bedford-Kingston intersection also operates at LOS D during the eve-

TABLE IV A-2

Existing (1988) Conditions - Traffic Operations Summary

SIGNALIZED INTERSECTIONS

Intersection Location	AM Peak Hour LOS	AM Peak Hour Average Delay	PM Peak Hour LOS	PM Peak Hour Average Delay	SAT Peak Hour LOS	SAT Peak Hour Average Delay
Summer-High-South	B	10.96	C	7.20	B	7.37
Summer-Lincoln-Bedford	B	8.82	B	10.47	B	8.30
Summer-Otis-Kingston	B	6.76	B	6.68	B	6.99
Surface Artery-Essex-Lincoln	C	15.14	C	18.81	B	12.97
Essex-Washington	B	8.25	B	8.81	B	7.34

UNSIGNALIZED INTERSECTIONS

Intersection Location	AM Peak Hour LOS	AM Peak Hour Reserve Capacity	PM Peak Hour LOS	PM Peak Hour Reserve Capacity	SAT Peak Hour LOS	SAT Peak Hour Reserve Capacity
Bedford-Columbia						
Columbia NB	A	489	A	818	A	744
Bedford-Kingston						
Kingston SB	A	435	D	115	B	378
Bedford-Chancy-LP Garage						
Lafayette Ent. EB	A	824	A	668	A	815
Bedford WB	A	510	B	326	A	506
Essex-Kingston-Ave. de Lafayette						
Kingston SB						
LT	C	263	F	0	C	247
TH	A	463	D	131	C	416
Essex-Harrison-Chauncy						
Harrison SB						
LT	D	184	D	125	F	0
TH	C	233	D	133	D	175
Harrison-Beach						
Beach WB	A	504	B	317	B	355

ning peak hour period. All of these intersections are not signalized at the present time.

Public Transportation System

The Kingston-Bedford-Essex Street site is ideally situated for both local and regional public transit access. It is at the hub of the regional public transportation system, where subway, light rail, commuter rail, and express buses converge. In addition, the site has good access to local bus routes which connect the core of the downtown commercial area with other city neighborhoods.

For this development, as well as other downtown projects, good transit access is an important part of the attractiveness of the site to employees and visitors; and such strong transit access is important in supporting the economic vitality of the site and the activities that will occur there.

The city and region have enjoyed a recent period of heightened public and private attention to the importance of maintaining and enhancing the region's transit service network. The MBTA has undertaken major capital investment and service improvement efforts, most notably the new Orange Line in the Southwest Corridor. In addition, a significant effort has been underway to expand the capacity of the transit system by adding cars and increasing the length of rapid transit trains. Major improvements have also been made to the South Station and Downtown Crossing-Washington Street stations near the project location. Such improvements provide a positive context for transit service both near the Kingston-Bedford-Essex Street site and in the regional system which converges in the downtown core.

The site's proximity to South Station, planned as a major regional transportation center, will enhance the accessibility and attractiveness of the site to future users. South Station is expected to serve not only as a commuter rail hub, which it does already, but as a truly intermodal facility. Greyhound Bus Lines will relocate from its current Stuart Street location to an expanded South Station location. In addition, South Station will provide express service to and from Logan airport.

The Massachusetts Bay Transportation Authority continues to implement plans for expanding capacity on both its rapid transit lines and on its commuter rail lines. Until 1988, four-car trains were the peak-hour norm on both the Red Line and Orange Line trains. Currently, the running of six-car trains during peak hours has added capacity on each line. The MBTA is currently looking at lengthening the stations on the Blue Line, permitting the running of six-car trains and increasing the capacity of the line and the system.

The MBTA is also studying the feasibility of extending its commuter rail lines, as well as adding additional lines where ridership projections warrant. Currently, the MBTA is researching several commuter rail extensions to Route 495 and beyond. To allow increased use of their existing lines, the Authority is putting resources into expanding its park-and-ride facilities. The MBTA already has almost 14,000 parking spaces to serve its rapid transit lines, and 11,600 spaces to serve its commuter rail lines. Studies are underway to investigate expansion of parking facilities throughout the MBTA system.

As a result of these planned projects, the capacity of the public transportation system will be expanded in future years beyond the build year of the project.

Existing Conditions

The Kingston-Bedford-Essex Street site is well located with respect to several rapid transit stations. One can walk in well under five minutes from the site to South Station (800-900 feet east of the site) serving the Red Line, the Chinatown station (900-1000 feet west) serving the Orange Line, and Downtown Crossing (900-1100 feet northeast), serving both the Red and the Orange Lines. One can walk within five minutes to Park Street Station, serving the Green Line as well as the Red Line. Due to the excellent availability and accessibility of public transit in the vicinity of the site, it is expected that many of the trips generated by the development will use mass transit.

The site is also within two blocks of several public express bus lines. These are route numbers 300, 301, 304, 304A, and 305, serving Riverside, Brighton Center, Watertown, Newton Corner, and Waltham. Private express buses connecting South Shore communities with downtown also stop close to the project site at South Station, and at least four local bus lines stop within five blocks of the site.

The transit lines and stations and the bus routes in the vicinity of the project site are shown in Figure IV A-7.

Finally, the site is well located with respect to regional and national transportation. South Station, in addition to serving as a rapid transit station, serves as a regional transportation hub. It is the downtown terminal for commuter rail lines serving communities both south and west of Boston, including Framingham, Franklin, and Providence, Rhode Island. South Station is the northeastern-most transit terminal for Amtrak national railroad service. Intercity buses also serve the area at the Dewey Square terminal and, to the west of the project site, at Park Square.

Existing Public Transportation System Capacity and Ridership

In order to estimate the impact of the project on the public transportation system and the system's capacity to serve the development, existing and future public transportation capacity and ridership figures have been developed. In this analysis, emphasis has been placed on the rapid transit system, as this is the primary means of providing public transportation service to the project site. While project employees and visitors are expected to use MBTA express buses as well, the MBTA has a policy of expanding bus service as ridership grows. Thus, they are not as capacity constrained as are the fixed rail systems serving project users.

The concept of transit system capacity is defined in terms of the passenger carrying capability of the system's stairways, turnstiles, platforms, and vehicles for a given time period, typically a peak 2-3 hour period, a one-hour peak, or even a 15-minute peak period. In downtown Boston, unlike larger cities such as New York or Chicago, stairway capacity has not been a problem for downtown stations. Prior station modernization programs have improved turnstile capacity and station amenity at most downtown stations. In addition, recent MBTA station modernization programs and platform lengthenings to accommodate six car trains have largely relieved overcrowded platform conditions for the Red and Orange Lines. Work is ongoing in 1989 to further improve Washington Street station, with existing entrances being refurbished, a new entrance and elevator created within

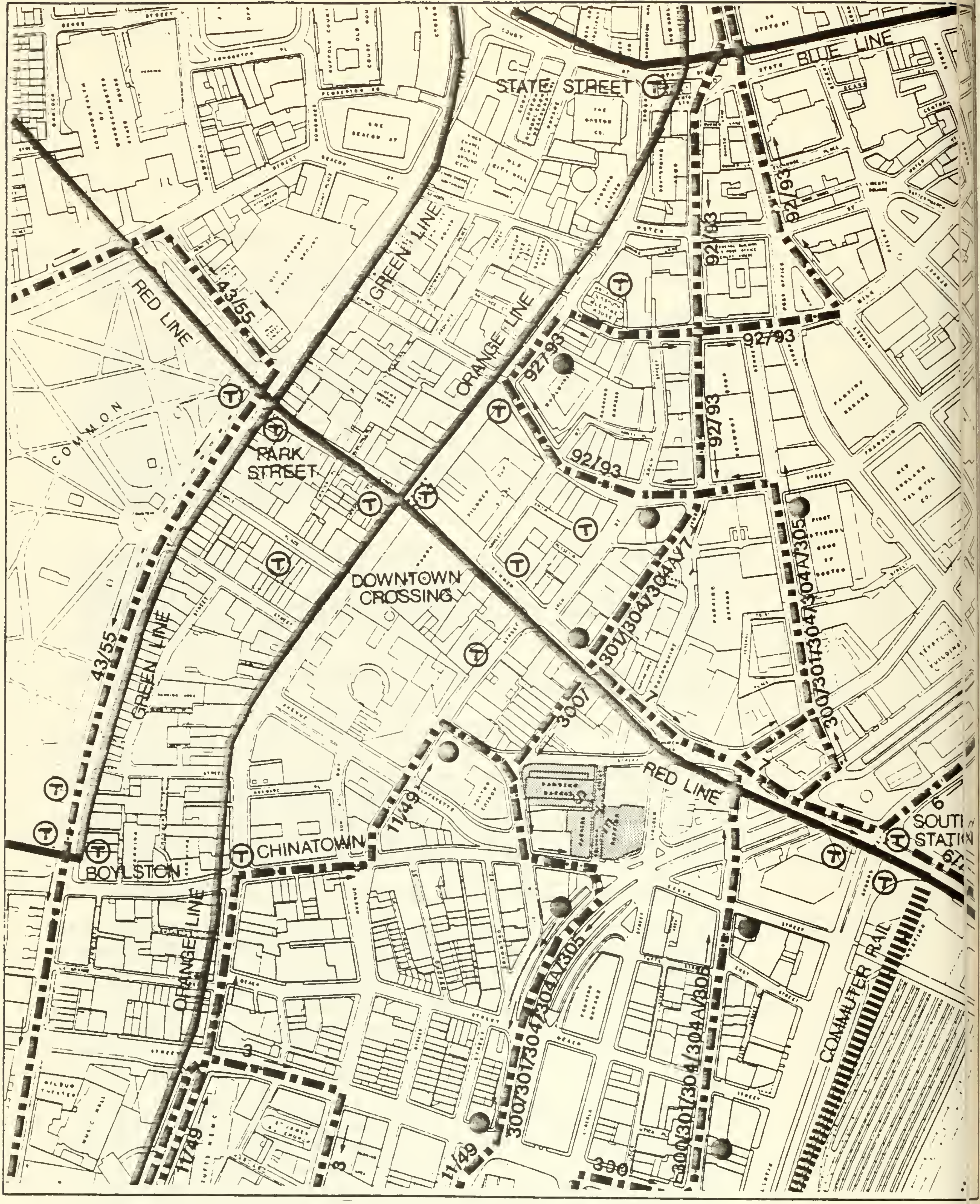


Figure IV A-7:
MBTA Bus and Rapid Transit Lines and Stations

RAPID TRANSIT LINES
BUS ROUTES
RAPID TRANSIT STATIONS
BUS STOPS
43/55 BUS ROUTE NUMBERS

N

the 101 Arch Street development, and a new Franklin Street entrance created in Filene's Park. South Station improvements also are under construction. All downtown stations are currently accessible to the handicapped, with the exception of the Chinatown Orange Line station. At this location, the MBTA is evaluating the feasibility of creating a new entrance and elevator, possibly in conjunction with the 600 Washington Street development. Thus, the actual carrying capacity of the trains themselves is the major transit impact issue.

Line capacity for a given transit schedule is a function of the number of trains per hour (headway), the number of cars per train, and the number of passengers per car. For this study, capacity was estimated through the following steps:

- Determining for each line the number of peak hour trains (sixty minutes divided by the scheduled headway). To meet a given schedule for trains in both directions may require more or less total trains than will actually pass through a checkpoint in the peak hour, depending on the running time for the round trip. Thus, the total number of trains available will not equal the actual number of trains running in the peak one-hour period.
- Calculating the total number of peak hour cars -- number of trains multiplied by number of cars per train. This parameter varies for each line.
- Calculating the total number of passengers -- number of cars multiplied by the passenger carrying capacity of each car. For this study, capacity is defined as the seating capacity for each type of car, plus the number of standees which could be accommodated at 2.5 square feet per person, or approximately 3 passengers per seat. This is equivalent to a Level of Service E according to the Highway Capacity Manual. By comparison, a maximum "crush loading" is defined as 3.8 passengers per seat.

The data upon which current transit line capacity calculations have been based is included in Table IV A-3. Table IV A-4 summarizes the current capacities and ridership for the peak direction at the peak station/link in the peak hour for the Red, Orange, Blue, and Green Lines.

As illustrated in Table IV A-4, the lines where existing ridership approaches capacity of the system in the peak hour are the Blue Line and the Green Line between Arlington and Copley Stations. The MBTA has addressed this situation by adding "Run as Directed" (RAD) trains, as shown in Table IV A-3. In the case of the Red Line, three peak period six-car trains are available to supplement Ashmont and South Shore service on an unscheduled basis, each of which makes one trip in each direction during the peak hour. This capability raises potential Red Line peak hour carrying capacity by 3,240. One extra "RAD" train is available to serve the Blue Line.

Pedestrian Environment

The Kingston-Bedford-Essex Street site is ideally situated for pedestrian access given its location near the retail center of Downtown, with excellent access to nearby transit stations and terminals, parking and other office, retail, governmental, and recreational facilities. The development of surrounding parcels formerly occupied by parking facilities, such as 99 Summer Street, has served to bring new ground-level retail uses and pedestrian activity to an area which had been somewhat of a barrier in the past. Pedestrian volumes in the study area are based upon a combination of field counts taken by WCH Industries and by

TABLE IV A-3

Existing (1988) MBTA Rapid Transit Peak Hour and Line Capacity

Line/Segment	Cars/ Train	PM Peak Sched. Headway	PM Peak Hr. Trains	PM Peak Hr. Cars	Car Capacity	PM Peak Hr. Capacity
ORANGE						
Oak Grove - Forest Hills	6	4.5 min	14	84	155	13,020
	4	4.5 min	4	16	155	2,480
Total			18	100		15,500
GREEN						
N. Sta. - Cleveland Cir.	2	7 min	7	14	165	2,310
Cleveland Cir. (RAD)	1		7	7	165	1,155
Government Center - Boston Col.	2	6 min	12	24	165	3,960
Government Center - Riverside	2	6 min	12	24	165	3,960
	1		3	3	165	495
Brigham Circle - Lechmere	2	8 min	8	16	165	2,640
Lechmere - (RAD)	1		8	8	165	1,320
Total			57	96		14,816
RED						
Alewife - Ashmont	4	8 min	7	28	180	5,040
	6		5	30	180	5,400
Braintree - Alewife	4	8 min	5	20	180	3,600
	6		9	54	180	9,720
"Run As Directed" (RAD)	6		3	18	180	3,240
Total Red Line*			29	150		27,000
BLUE						
Bowdoin - Wonderland	4	3-4 min	15	60	110	6,600
"Run as Directed" (RAD)	4		1	4	110	440
Total			16	64		7,040
TOTAL TRANSIT LINES			120	410		64,356

* Note: excludes Mattapan trolley service feeding Ashmont Station

Source: MBTA, Operations Directorate, Planning Division, Ridership and Service Statistics, October, 1988; Letter from Michael Burns, December, 1988 (see Appendix B-4).

TABLE IV A-4

Existing (1988) Transit Capacities and Ridership
Peak Hour, Peak Direction

Peak Load Points	Scheduled Capacity*	Av. Passenger Load **
RED LINE		
Between Andrew and JFK (Ashmont)	10,440	5,400 (PM)
Between Andrew and No. Quincy (Braintree)	13,320	7,350 (PM)
BLUE LINE		
Between Maverick and Aquarium	7,040	6,750 (AM)
ORANGE LINE NORTH		
Between Haymarket and North Station	15,500	9,300 (AM) 8,900 (PM)
ORANGE LINE SOUTH		
Between Back Bay and NEMC	15,500	8,800 (AM) 7,650 (PM)
GREEN LINE WEST		
Between Arlington and Copley	12,341	10,000 (#)
GREEN LINE NORTH		
Between No. Station & Science Park	2,640	1,100 (#)

* See Table IV A-3 for capacity analyses

** Sources: MBTA, Ridership and Service Statistics, Operations Directorate, Planning Division, October, 1988 page 2-8; letter from Michael Burns to Howard/Stein-Hudson, December, 1988, (included as Appendix B-4).

\# 1986 estimate: 125 High Street DEIR, Vanasse/Hangen, Inc.

Vanasse/Hangen Associates (1986). Table IV A-5 provides a summary of the counts taken during the morning and afternoon peak periods. These volumes do not necessarily occur at the same time as the peak vehicular flow for the intersections. The most significant pedestrian activity occurs during the AM and PM peak hours along Summer Street, reflecting commuter travel to and from South Station. Pedestrian flow during the peak hours and on Saturday is primarily in an east-west direction. The other intersections have pedestrian volumes of fewer than 200 pedestrians per hour. These are easily accommodated by area sidewalks and are summarized in the "low" and "moderate" category for purposes of the traffic capacity analyses.

In general, many of the downtown streets are narrow and traffic volumes are sufficiently low and slow moving that pedestrian movement is not obstructed. For most interior streets, the primary cause of conflicts or safety problems for pedestrians is building and street construction activity which necessitates use of temporary walkways, creates holes in streets which block certain paths, or prohibits certain street crossings. However, the Surface Artery and Central Artery ramps near South Station do pose pedestrian problems in terms of fast moving traffic and inconvenient pedestrian crossings. Ongoing City street improvement plans and building site plans will improve these situations over time.

Parking

For purposes of analyzing parking supply and demand, a study area broader than that of the traffic analysis study area was determined in consultation with the City of Boston Transportation Department and the Boston Redevelopment Authority. This area, which accounts for downtown destinations of 91% of current Kingston-Bedford parkers, is shown in Figure IV A-8.

The project site presently accommodates approximately 731 parking spaces, including an estimated 550 spaces (practical capacity) in the mechanical Kingston-Bedford Garage, 51 spaces in the Essex St. lot west of Columbia Street, and 130 spaces in the Lincoln-Essex lot to the east of Columbia Street. All of the parking is open to the public. The largest garage facilities in the study area are the Lafayette Place Garage (1,050 spaces), Winthrop Square Garage (1,125 spaces), and the Kingston-Bedford Garage (550 spaces).

There are also various small, off-street surface parking lots. As shown in Table IV A-6 and Figure IV A-8, 5,354 total off-street parking spaces existed in the study area in 1988, of which 10 percent (537 spaces) were in lots and 90 percent (4,817 spaces) were in garages. Of these, 76 percent were open to the public and 24 percent were reserved for employees. These spaces served a study area office/retail employee population estimated at 40,000 for 1986. In 1986, when peak occupancy was last surveyed, it was 4,798, or 90 percent of capacity, between noon and 1 PM. The all-day rates for public parking varied from $4.40 at the Winthrop Square Garage to $19.00 at 150 Federal Street, with a typical all-day rate in the $10-12 range.

On-street parking is quite limited within the study area. For traffic control purposes, a significant proportion of the on-street spaces are signed "No Parking" during the weekday commuter periods (7:00 - 9:30 AM and 4:00 - 6:00 PM). The available on-street parking supply is fully utilized by midday. (Vanasse/Hangen, Transportation Impact Study and Access Plan - 125 Summer Street Development, 1986.)

TABLE IV A-5

Existing Pedestrian Volumes
(Weekday AM/Weekday PM/Saturday PM)

Intersection	North Crosswalk	South Crosswalk	East Crosswalk	West Crosswalk
Summer-Lincoln-Bedford	NA/NA/NA	210/230/10	1190/1286/108	138/191/16
Bedford-Columbia	NA/NA/NA	30/66/112	237/100/14	143/22/38
Bedford-Kingston	233/238/94	88/79/84	122/157/60	154/180/79
Surf. Art.-Essex	281/257/50	91/96/85	242/199/39	29/36/26
Essex-Lincoln	163/145/98	15/200/43	242/199/39	19/36/26
Essex-Columbia	129/138/90	NA/NA/NA	27/44/47	20/16/42
Essex-Kingston-Ave. de Lafayette*	145/180/NR	89/96/NR	28/40/NR	61/78/NR

NA: not applicable – no crosswalk volumes on this leg of a "T" intersection.

NR: not recorded - assumed to be lower than weekday volumes, similar to the other intersections

* City of Boston Transportation Department pedestrian counts recorded on July 23, 1986. All others taken by WCH Industries, Inc., and Vanesse/Hangen, 1986.

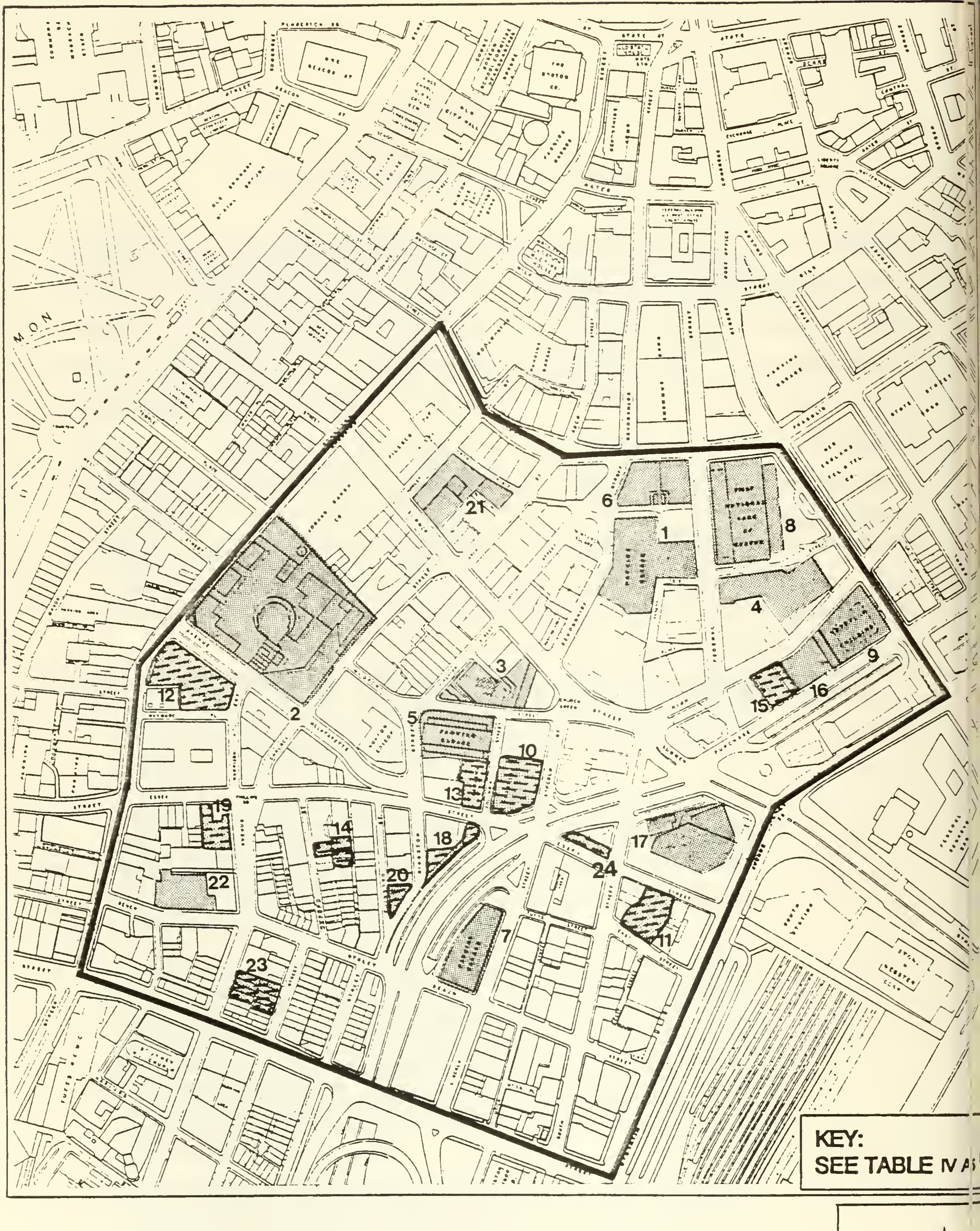


Figure IV A-8:
Existing (1988) Conditions Parking Supply

TABLE IV A-6

Study Area Off-Street Parking Supply: 1988

Map No.	Location	Type	Use	Capacity 1988	Day Rate 1988
1	Winthrop Square Garage	Garage	Public	1,125	$ 4.40
2	Lafayette Place Garage	Garage	Public	1,050	13.00
3	99 Summer Street	Garage	Private	70	
4	75-101 Federal Street	Garage	Private	140	
5	Kingston-Bedford Garage	Garage	Public	550	9.50
6	150 Federal Street	Garage	Private	365	19.00
7	84-96 Beach Street	Garage	Public	350	10.00
8	100 Federal Street	Garage	Private	197	
9	Keystone Building	Garage	Private	163	
10	Lincoln-Essex Lot	Lot	Public	130	13.00
11	203-213 Essex Street	Lot	Public	83	11.00
12	564-580 Washington St.	Lot	Public	64	11.00
13	128-130 Essex Street	Lot	Public	51	12.00
14	3-5 Ping On Street	Lot	Public	28	12.00
15	Purchase Street Lot	Lot	Private	24	
16	Purchase Street Garage	Garage	Private	20	
17	One Financial Center	Garage	Private	260	
18	130 Kingston Street	Lot	Public	18	12.00
19	33-37 Essex Street	Lot	Public	47	
20	22 Edinboro Street	Lot	Public	15	12.00
21	101 Arch Street	Garage	Private	27	14.00
22	Shoppers' Garage	Garage	Public	500	9.25
23	17-21 Tyler Street	Lot	Public	65	
24	73-75 South Street	Lot	Private	12	
Total				5,354	
Public				4,067	76%
Private				1,278	24%
Garage				4,817	90%
Lot				537	10%

To determine the characteristics of current parkers in the vicinity of the project site, detailed parking occupancy, turnover, and origin/destination surveys were conducted at the Kingston-Bedford garage, Lincoln-Essex lot, and the Lafayette Place garage in April, 1988. Key findings from these surveys are summarized in Table IV A-7.

As shown, the existing Kingston-Bedford garage is primarily a commuter garage, with 81% of the parkers using the garage for work trips, and an average parking duration in excess of 6 hours. About half the parkers at the Lincoln-Essex lot are workers and 32% in town for sales/business purposes. Average duration here is somewhat shorter at about four hours. About half the parkers at the Lafayette Place garage are also workers, 19% in town for sales/business, and 14% for shopping. The primary destination of parkers at the Kingston-Bedford garage and the Lincoln-Essex lot was CTPS zone 10C, which includes such large office buildings as 100 Summer Street and the Shawmut Bank Building. At Lafayette Place, not surprisingly, the primary destination was Zone 8C, in which the garage is located. Average walking distance of parkers to their destination was 800-900 feet, with parkers at the Kingston-Bedford garage, the lowest priced of the three, travelling the longest distance.

Traffic Assumptions for Impact Analysis

To compare the transportation impacts of the No Build option and the five development options, the standard steps of the transportation planning process -- trip generation, mode split, trip distribution, and network assignment -- were applied to the development parameters for each option, as discussed below.

Trip Generation Rates

Basic to a determination of development project transportation impacts is the estimation of the trips which the project will generate in various time periods of interest and for various travel modes. In the case of the Kingston-Bedford-Essex Street proposed development, besides looking at the trips generated during an average weekday and in the AM and PM hours of peak travel, the MEPA scope for environmental documentation also requested that trip-making for Saturday afternoon be included.

As a basis for trip generation in this report, the Institute of Transportation Engineers (ITE) Trip Generation Manual was used. It is one of the major references used in the estimation of trip generation and presents trip generation rates for a wide variety of land uses based on surveys of actual developments located at various sites across the country. It is also the only major reference which deals directly with Saturday trip-making, a requirement for this report. Another feature of the Manual is that for many land uses, notably office and shopping, trip rates are adjusted according to the size of the development, as found in the survey work.

The rates in the Manual deal with vehicle trips only, and in dominantly suburban settings where transit service is negligible. There is also no overt consideration of car occupancy as a variable factor, nor any division between journey to/from work and other trips. In order to apply these rates to central Boston where transit and walk-in trips play substantial access roles, the Manual vehicle trip rates had to be converted to person trip rates. The person trips had to be then broken down into the various travel modes (automobile, transit, walking) and work/non-work

TABLE IV A-7

Kingston-Bedford Garage Study Field Surveys: April, 1988
Summary of Parking Facility Characteristics

Kingston-Bedford Feature:	Lincoln-Essex Garage	Lafayette Place Lot	Garage
Capacity	550	130	1,050
All Day Rate	$9.50	$13	$13
Total Daily Parkers	468	272	1,363
Peak Traffic Hour:			
Enter:	8:30-9:30 a.m.	8:30-9:30 a.m.	8:30-9:30 a.m.
Exit:	5:45-6:45 p.m.	5:15-6:15 p.m.	4:30-5:30 p.m.
Peak Traffic Volume:			
Enter:	149	51	273
Exit:	108	34	229
Peak Accumulation:			
Hours:	11:45,12:00,1:15 2:15	12:00-1:00	12:30-1:30
Peak Occupancy:	354	127	860
% Capacity	48.2	96.9	81.9
Parking Duration:	8-9 hrs: 17.0% 9-10 hrs: 14.6% 10+ hrs: 11.7% 2-3 hrs: 10.3%	1-2 hours: 19.1% 0-1 hrs: 15.9% 2-3 hrs: 15.5%	10+ hrs: 16.3% 1-2 hrs. 15.1% 2-3 hrs: 11.2% 8-9 hrs: 9.4%
Average Duration:	6.39 hours	4.06 hours	6.28 hours
Parking Turnover:			
Based on full capacity	0.6	2.1	1.3
Based on peak occupancy	1.3	2.1	1.6
Parker Trip Purpose:	Work: 81%	Work: 53% Sales/Business: 32% Personal: 10%	Work: 54% Sales/Business: 19% Shopping: 14%
Av. Walk Distance:	891 feet	828 feet	804 feet
Primary Destination (CTPS Zone)*	10C: 34%	10C: 34%	8B: 36%

* See Figure IV A-16

categories. Vehicle trips were obtained by dividing auto person trips by appropriate car occupancy factors.

In this report, person trips were obtained from the ITE vehicle rates by conversion factors related to ITE probable car occupancies and an allowance for some nominal transit and walk access. The resultant person trip rates for each activity and time period were also compared for compatibility with person trip rates used in other Boston transportation analyses. Trip estimation had to be done by land use for each development option considered.

The Boston trip generation sources referred to were Central Transportation Planning Staff (CTPS) interim trip generation rates related to the Central Artery project, the "Draft Access Plan Guidelines" of the Boston Transportation Department (BTD), and a number of environmental impact reports for previous downtown developments. These were referenced for consistency checks and used for the estimation of the division between work and non-work trips. The person trip rates adopted are presented in Appendix B-5 for each land use by analysis period, divided into work and non-work categories. (It may be noted that a "work" trip includes only the journeys to or from the place of employment. Additional trips made by employees, even on business, would be considered "non-work".)

In order to give a somewhat more detailed record of the actual basis for the rates adopted, the person trip generation rates for each land use are discussed below. It should be noted that the size of the office land use component is by far the largest, so that office trip rates have the greatest impact on the total trip generation of all options.

Office Person Trip Rates

The ITE Manual notes that the average car occupancy for office trips is 1.2 persons. The Manual vehicle rates per 1,000 sq.ft. for General Office (Land Use Code 710) were multiplied by this 1.2 factor and further augmented by 10% to allow for nominal transit and walk-in access, which is low or non-existent in the Manual. This resulted in a 1.32 times conversion factor, with weekday person trips rates around 12 arrivals and departures, compared to a CTPS interim rate of 13.4. The Kingston-Bedford-Essex Street rates are a little lower because the CTPS rate is constant and intended to represent an average development, which is smaller than any Kingston-Bedford-Essex Street build alternative. The conversion factor used would be equivalent to the CTPS rate at an office development size of about 300,000 sq.ft.

The ITE rates vary according to the size of the office development, with larger developments having lower trip rates per 1,000 sq.ft. This is related in part to the fact that larger office buildings have fewer employees per unit area and that more non-work trips are satisfied on site. As the Manual recommends, the rates were calculated by using the equations given for the different time periods considered. For calculation of the proportion of work and non-work trips, total person trips were divided in accordance with the interim CTPS work/non-work proportions for the corresponding time period.

Retail Person Trip Rates

In a manner generally similar to the estimation of office rates, the ITE Manual retail (Shopping Center, Land Use Code 820) vehicle rates per 1,000 sq.ft. were factored to produce person trips. The rates were not, however, varied according to the precise size of the retail component of each development option. This is because the Manual rates apply to free-standing retail developments in suburban locations, where few, if any other retail shops are within walking distance. In the case of the Kingston-Bedford-Essex Street project, the relatively small ground floor retail development can not be seen in isolation from the more than one million square feet of downtown retail within easy walking distance, and so must be put in the context of a major shopping area. The ITE rates used for all development alternatives were therefore calculated at a level of 1,000,000 square feet.

A factor of 1.7, representative of the car occupancy of retail customers, was used to convert vehicle trips for the time periods considered to person trips. The resultant weekday person arrivals and departures is about 57, compared to a CTPS interim retail rate of about 60, and a BTD "Draft Access Plan Guidelines" general retail rate of about 37 person "trip ends". The various time period rates were divided into work and non-work components according to the corresponding retail proportions in the CTPS/BTD rates.

Hotel Person Trip Rates

ITE Manual vehicle trip rates per room for hotels (ITE Land Use Code 310) for the various time periods were converted into person trips by a factor of 2.0, which was chosen to calibrate to the common CTPS and BTD weekday person rate of just over 17 person arrivals and departures per room. Work and non-work components were derived by the proportions of such trips in the corresponding time periods of the CTPS/BTD rates, as with the other land use trips.

Modal Split and Car Occupancy Calculations

As stated above, the determination of total person trip generation is followed by the assignment of the person trips for each land use to the appropriate mode of transportation; i.e., automobile, transit, or walk/other (taxi, bike, etc.). For the vehicle trips, auto person trips are converted to auto trips by vehicle occupancy factors, i.e., the number of persons per car for each type of trip.

Mode split and vehicle occupancy tend to vary between different land uses due to the specific trip making characteristics related to each. The distinction between various mode split and vehicle occupancy factors also applies to the type of trip being made, most commonly divided into work and non-work trips. For example, the mode split for hotel workers is similar to that for office workers or retail workers, but hotel guests will have very different patterns both from the hotel workers and from office visitors or retail customers. Mode split and vehicle occupancy is also heavily influenced by the location of the particular development, especially in terms of vehicular and transit accessibility and parking availability and price.

Table IV A-8 presents the mode split and vehicle occupancy trip making characteristics by land use for work and non-work trips to the development site as a fairly typical downtown Boston location. These mode split and vehicle occupancy factors are derived from several sources in order to achieve factors appropriate

TABLE IV A-8

Trip Making Characteristics by Land Use to Downtown Boston[1]

Land Use	Auto	Vehicle Occupancy	Transit	Walk/ Other
	Percentage Share			
Office				
Work	30.0%	1.8	60.0%	10%
Non-work	27.5%	1.4	47.5%	25%
Retail				
Work	30.0%	1.4	60.0%	10%
Non-work	27.5%	1.9	32.5%	40%
Hotel				
Work	30.0%	1.4	60.0%	10%
Non-work	55.0%	1.9	20.0%	25%

1. Sources: Cambridge Systematics, Parking in Downtown Boston, 1983; Vanasse/Hangen/Brustlin, 125 High Street EIA, 1986; PBQD and Norman Abend, Copley Place EIR, 1978; Howard/Stein-Hudson Associates field surveys.

for the Kingston-Bedford-Essex Street location and to be consistent with assumptions used in other studies for nearby projects.

Specific points of interest about the sources and rates used in the above table are presented below by land use category.

Office and Retail

The primary source for the modal split and car occupancy rates for the office work and non-work trips was the Environmental Impact Assessment for 125 High Street, prepared by HMM Associates and Vanasse/Hangen/Brustlin Associates in 1986. These rates were based primarily upon actual building surveys conducted by Cambridge Systematics, Inc., as reported in its 1983 report, Parking in Central Boston. One change was made to the rates, namely the reduction of the work trip transit share from 70% to 60% to allow for 10% walk trips. This shift was judged appropriate due to the increase in downtown and central neighborhood housing supply and to other surveys which indicate that many central neighborhood residents walk to work.

Hotel

For hotel work trips, the 125 High Street Environmental Impact Assessment was used. For non-work trips, rates used in the Copley Place Environmental Impact Report (1978), conducted by Parsons Brinckerhoff and Norman Abend, which were based upon surveys of hotels, were used, adapted for the differences between the Back Bay and Downtown locations.

Kingston-Bedford-Essex Development Trips

The trip generation rates and associated parameters described in the preceding sections were applied to each development alternative by individual land use to yield project-generated person trips by mode. These are set forth in Table IV A-9 and are depicted in a number of bar charts in a comparative fashion in Figure IV A-9.

As shown in Table IV A-9 and Figure IV A-9, total weekday person trips by land use range from around 10,000 trips per day for the 250 ft. Tower to 14,000 trips per day for the 400 ft. Tower. The 325 ft. Tower, the Expanded Site, and the Developer's Proposal generate from 12,000 - 13,000 person trips per day. The distribution of trips by use varies for each option. The hotel use generates from 1/4 to 1/3 the total daily trips for the 400 ft. Tower, the 325 ft. Tower, the 250 ft. Tower, and the Expanded Site. For the Developer's Proposal, which does not include a hotel, the primary trip generator is the office use.

The land use mix also affects the extent and nature of peak hour tripmaking. In the AM peak hour, the 400 ft. Tower and the Developer's Proposal each generate around 1,800 person trips in and out, with the other three varying from around 1,200 to 1,500 person trips. For all uses, the office use is the primary generator. In the PM peak hour, the Developer's Proposal generates about 1,900 trips in and out, and the 400 ft. Tower generates 1,800 trips. The 325 ft. Tower, the 250 ft. Tower, and the Expanded Site range from 1,200 to 1,500 person trips. Again, office use is the primary generator. However, in the PM peak hour, there are obviously more retail trips than in the AM peak hour, which occurs before stores are open.

TABLE IV A-9

Person Trip Summary by Alternative

	400 ft. Office	325 ft. Office	ALTERNATIVE 250 ft. Office	Expanded Site	Developer's Proposal
TOTAL ADT:					
Work	5,874	5,043	4,196	4,972	6,443
Non-Work	8,158	7,079	6,081	8,042	5,976
Total	14,032	12,122	10,277	13,014	12,419
AM PEAK					
Entering (In)					
Work	995	835	671	792	1,241
Non-Work	479	371	294	433	321
Total In:	1,474	1,206	965	1,225	1,562
Leaving (Out)					
Work	0	0	0	0	0
Non-Work	320	253	199	284	242
Total Out:	320	253	199	284	242
Total					
Work	995	835	671	792	1,241
Non-Work	799	624	493	717	563
Total	1,794	1,459	1,164	1,509	1,804
PM PEAK					
Entering (In)					
Work	85	73	59	70	114
Non-Work	388	316	263	369	272
Total In	473	389	322	439	386
Leaving (Out)					
Work	937	794	644	750	1,171
Non-Work	372	310	263	354	320
Total Out	1,309	1,104	907	1,104	1,491
Total					
Work	1,022	867	703	820	1,285
Non-Work	760	626	526	723	592
Total	1,782	1,493	1,229	1,543	1,877
SATURDAY TOTAL					
Work	2,194	1,890	1,579	1,937	2,276
Non-Work	4,827	4,491	4,089	5,289	3,549
Total	7,021	6,381	5,668	7,226	5,825
SATURDAY PEAK					
Entering (In)					
Work	72	65	55	66	89
Non-Work	248	242	228	271	180
Total In	320	307	283	337	269
Leaving (Out)					
Work	77	69	63	68	80
Non-Work	197	195	185	219	173
Total Out	274	264	248	287	253
Total					
Work	149	134	118	134	169
Non-Work	445	437	413	490	353
Total	594	571	531	624	522

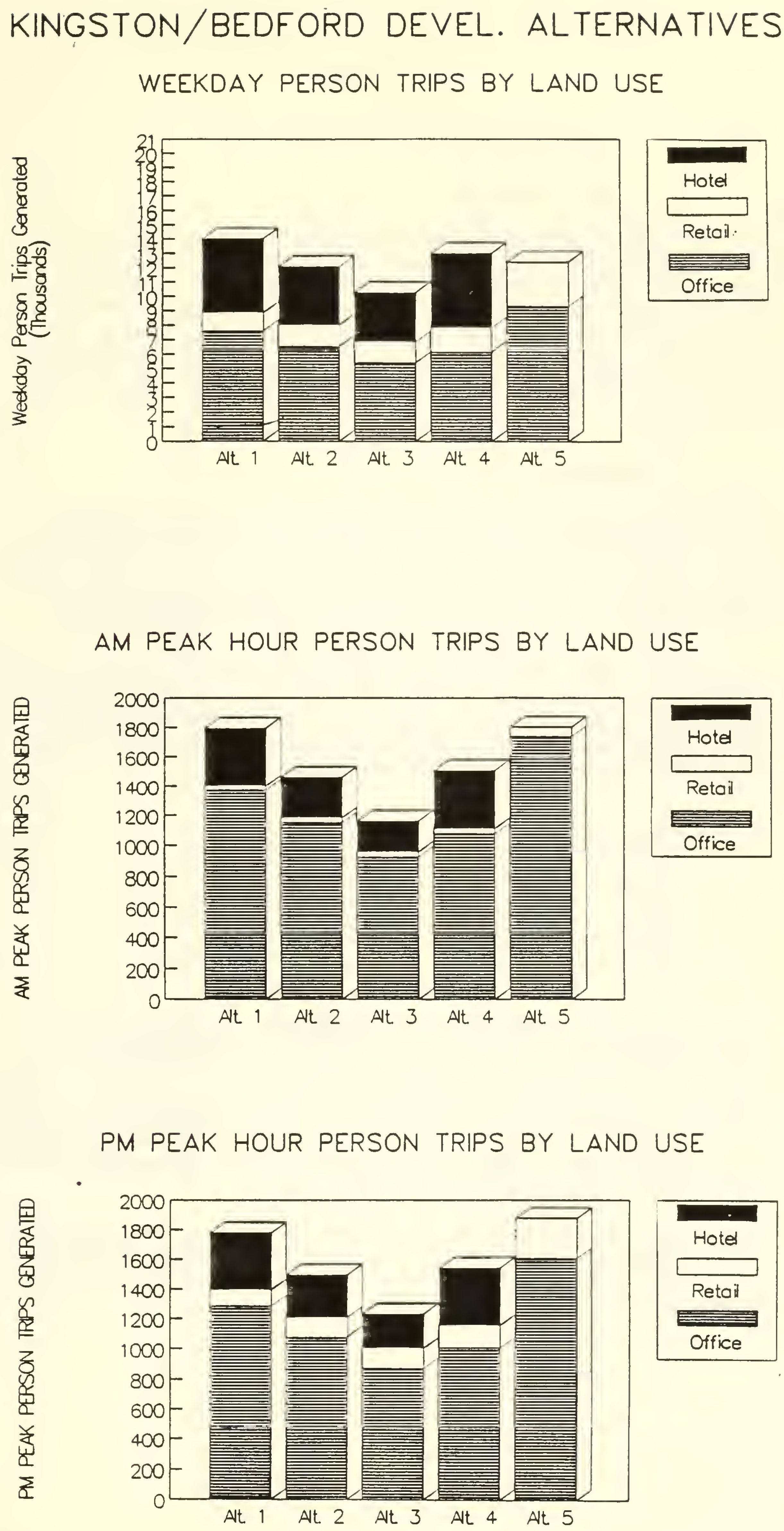


Figure IV A-9:
Person Trip Generation by Alternative

Table IV A-10 and Figure IV A-10 show the comparative vehicular trip generation of each build alternative. In terms of total weekday vehicle trips, the options range from around 2,100 vehicles/day for the 250 ft. Tower and the Developer's Proposal to nearly 3,000/day for the 400 ft. Tower and the Expanded Site, with the 325 ft. Tower at 2,500 vehicles/day. In the morning peak hour, the options range from around 225 vehicles/hour for the 250 ft. Tower to 300-350 in and out for the four other alternatives. In the PM peak, the options are within 100 cars, with the 250 ft. Tower the lowest at a little over 200 cars/hour and the others between 300-350 cars/hour.

Vehicular Trip Distribution

The future project traffic volumes for impact analyses of the Kingston-Bedford-Essex Street alternatives at key intersections were estimated by distributing the vehicle trips generated into the directions of origin/destination, and assigning this directional division of trips to the actual roadways serving the development. Such assigned volumes, when added to the existing and background growth traffic, form the future traffic volume input for calculation of Levels-of-Service (LOS).

The basis for the regional trip distribution proportions was the origin/destination information gathered from current surveys (H/SH, 1988) of parking at the Kingston-Bedford-Essex Street site, as well as at Lafayette Place. The origin-destination from this survey shows the following general pattern of vehicular travel to the project area, with some rounding of the percentages:

General Area	Percent of Trips
North	20
South	30
West	30
Boston Urban Core	20
	100%

For estimation purposes, the trips to and from the urban core, including and immediately surrounding the downtown area, have been designated local in nature. The compass direction area trips outside of the core area are considered regional. For the local trips, an even directional distribution into the four compass directions is assumed (5% for each), including east, which represents South Boston across the Fort Point Channel. Regional trips are divided according to the survey proportions, omitting east, which in the regional sense is Massachusetts Bay. This division of trips by direction is shown in Table IV A-11.

To assign the distribution to the actual street network serving the project, judgments were made on what proportions of local and regional trips would travel on specific streets, as shown in Table IV A-12. Trips to the site and from the site are differentiated in the table.

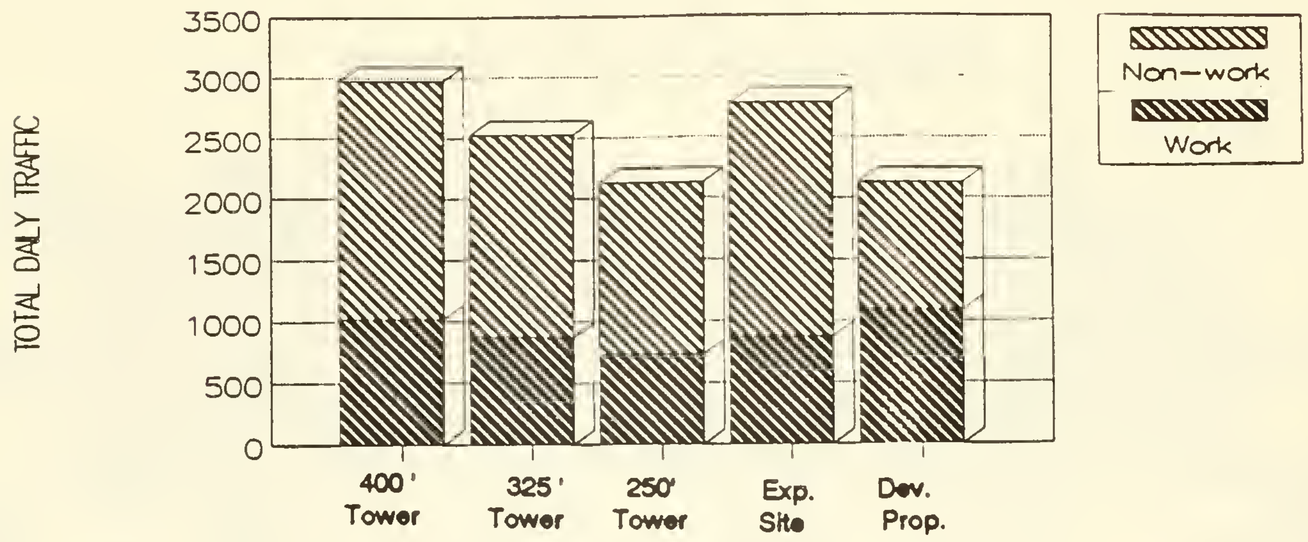
TABLE IV A-10

Vehicle Trip Summary by Alternative

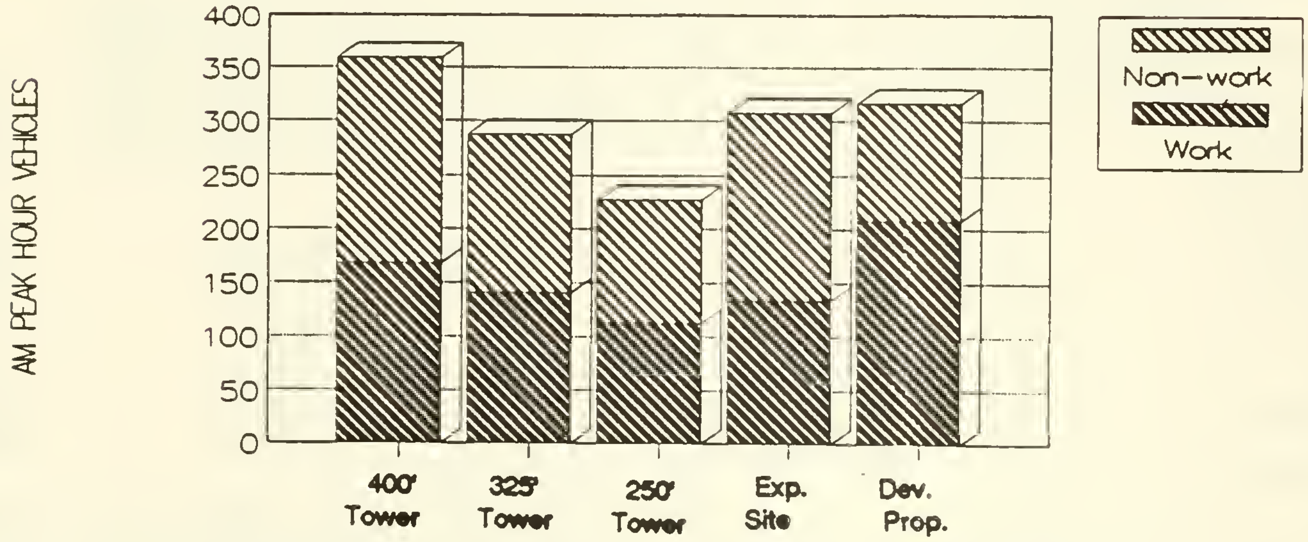
	ALTERNATIVE				
	400 ft. Office	325 ft. Office	250 ft. Office	Expanded Site	Developer's Proposal
TOTAL ADT:					
Work	1,023	878	732	875	1,091
Non-Work	1,954	1,648	1,396	1,910	1,034
Total	2,977	2,526	2,128	2,785	2,125
AM PEAK					
Entering (In)					
Work	168	141	113	134	208
Non-Work	116	88	69	106	62
Total In:	284	229	182	240	270
Leaving (Out)					
Work	0	0	0	0	0
Non-Work	75	58	45	68	47
Total Out:	75	58	45	68	47
Total					
Work	168	141	113	134	208
Non-Work	191	146	114	174	109
Total	359	287	227	308	317
PM PEAK					
Entering (In)					
Work	15	13	10	12	20
Non-Work	94	74	61	89	48
Total In	109	87	71	101	68
Leaving (Out)					
Work	157	133	108	126	197
Non-Work	86	69	58	81	57
Total Out	243	202	166	207	254
Total					
Work	172	146	118	138	217
Non-Work	180	143	119	170	105
Total	352	289	237	308	322
SATURDAY TOTAL					
Work	402	349	294	363	401
Non-Work	1,186	1,055	941	1,251	524
Total	1,588	1,404	1,235	1,614	925
SATURDAY PEAK					
Entering (In)					
Work	12	11	9	11	15
Non-Work	61	58	54	64	27
Total In	73	69	63	75	42
Leaving (Out)					
Work	14	12	11	12	14
Non-Work	47	44	42	50	26
Total Out	61	56	53	62	40
Total					
Work	26	23	20	23	29
Non-Work	108	102	96	114	53
Total	134	125	116	137	82

KINGSTON/BEDFORD DEVEL. ALTERNATIVES

WEEKDAY VEHICLE TRIPS



AM PEAK HOUR VEHICLE TRIPS



PM PEAK HOUR VEHICLE TRIPS

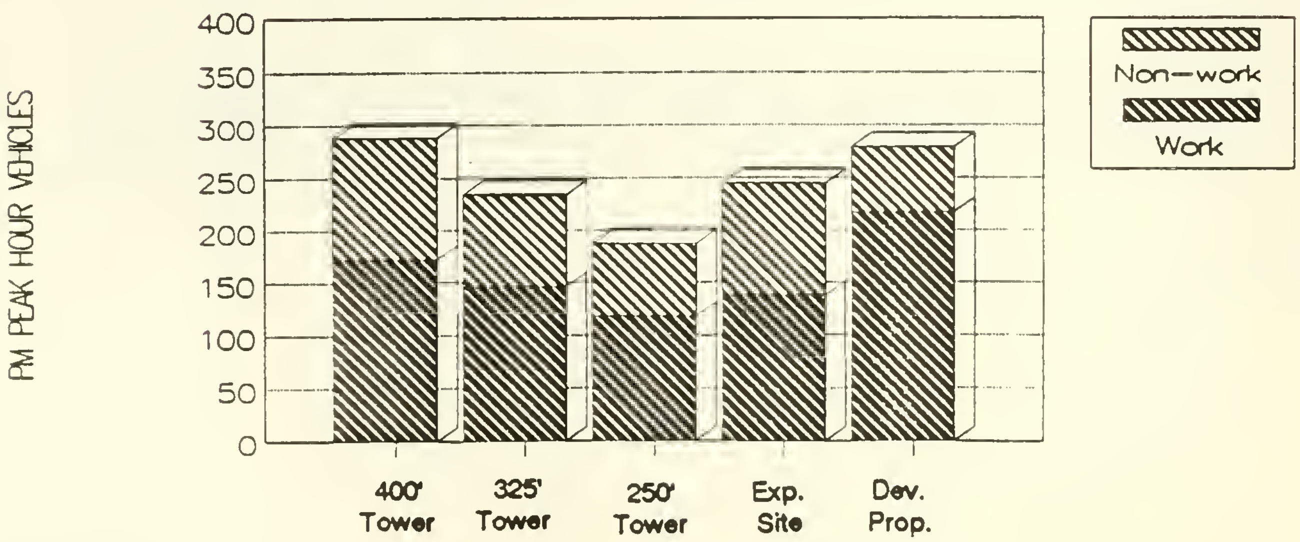


Figure IV A-10:
Vehicle Trip Generation by Alternative

TABLE IV A-12

Proportional Assignment of Kingston-Bedford-Essex Project Trips to Key Streets

To the Site:	Local Trips				Regional Trips				Rounded Distribution
	N	S	E	W	N	S	E	W	(Percent of Trips)
Essex St. EB	.4	.4	-	.5	.1	.1	-	.2	17%
Kneeland-Surf.Art.	-	.3	-	.5	-	-	-	.1	7%
Summer-Bedford	.6	-	1.0	-	.9	-	-	-	26%
Atlantic-Essex WB	-	-	-	-	-	-	-	.7	21%
Lincoln St.	-	.3	-	-	-	.9	-	-	29%
									100%

From the Site:	Local Trips				Regional Trips				Rounded Distribution
	N	S	E	W	N	S	E	W	(Percent of Trips)
Lafayette-Tremont	.2	.2	-	.4	.1	-	-	.2	12%
Lafayette-Harrison	-	.3	-	.3	-	.1	-	-	6%
Surf.Art.-Kneeland	-	.3	-	.3	-	-	-	.1	6%
Lincoln-Summer	.8	-	1.0	-	.1	-	-	-	11%
Kingston-Essex EB:									
- turning to south	-	.2	-	-	-	.9	-	.7	49%
- turning to north	-	-	-	-	.8	-	-	-	16%
									100%

TABLE IV A-11

Directional Distribution of Kingston-Bedford-Essex Vehicle Trips

Compass Direction	Local Area Component	Regional Component
North	5%	20%
South	5%	30%
East	5%	-----
West	5%	30%

The resultant percentage distribution in the above tables show a strong connection to streets leading directly to/from the Central Artery and the Massachusetts Turnpike, and a lesser use of purely local streets. A finer-grained distribution is very sensitive to the array of street directions available in the site area, such as on Essex Street and Kingston Street, and to the location of garage entrances and exits. As currently proposed, the garage design calls for an entrance and exit onto Kingston Street, and a reversible driveway at Lincoln Street, which would operate as an entrance in the morning and an exit in the evening. The resulting detailed assignments to study area intersections are shown by percentages in Figures IV A-11 and IV A-12 for entering and exiting traffic.

Public Transportation Trip Distribution

Public transportation trips for the No Build alternative and the five build alternatives were distributed to the various public transportation modes serving the site on the basis of the relative proportion of total Boston Proper trips carried by each of the public transportation modes. This breakdown is shown in Table IV A-13 and Figure IV A-13. As shown, rapid transit carries about 63% of total weekday peak hour public transportation trips in and out of Boston Proper, according to the 1982 Boston Proper cordon count conducted by the City of Boston Transportation Department. Streetcars (Green Line) carry about 18%; commuter rail, 9%; express and local buses, 9.7%; and commuter boat 0.3%. The cordon count showed that in the AM peak hour, public transportation carries about 58,000 persons into Boston Proper, and in the PM peak hour, public transportation carries about 67,000 persons out of Boston Proper.

To these figures were then applied more detailed MBTA ridership estimates which showed the proportion of peak hour riders for each line in each direction. The resulting share, as shown in Figure IV A-14, was then used as the basis for estimating no-build and build alternative public transportation impacts. Summaries of peak hour riders by line for each alternative are included in Section 4 of this chapter.

Pedestrian Trip Distribution.

Pedestrian trip distribution was based on an analysis of relative boardings at the transit stations within walking distance of the site, and to and from the Downtown Crossing shopping district and Chinatown. It is anticipated that entrances and exits will be provided for the Kingston-Bedford-Essex Street development at up to five locations, as illustrated in Figure IV A-15 (which shows the proposed entrances/exits for the Developer's Proposal). These are described below, along with the expected daily percentage of pedestrians projected to use each.

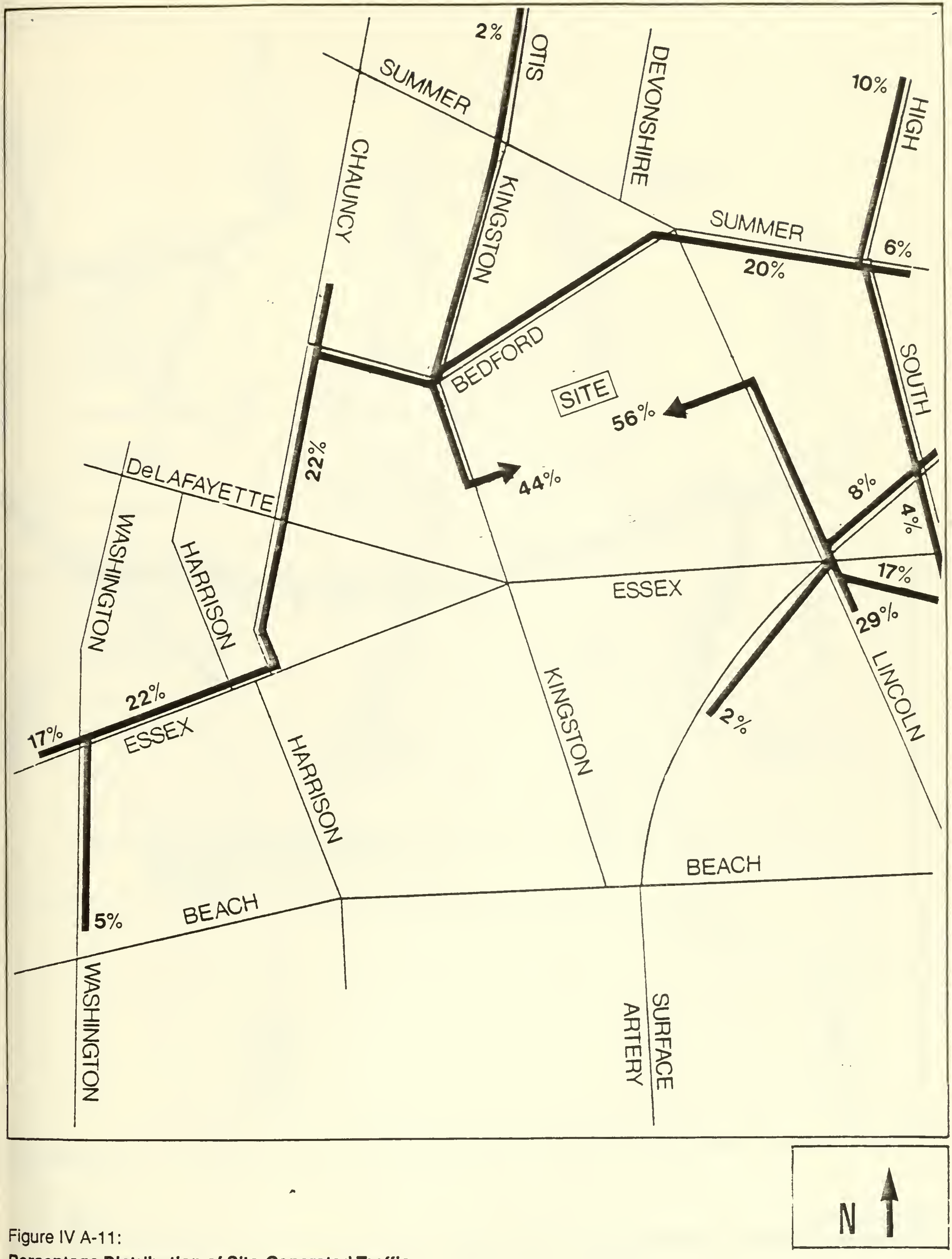


Figure IV A-11:

Percentage Distribution of Site-Generated Traffic: Entering

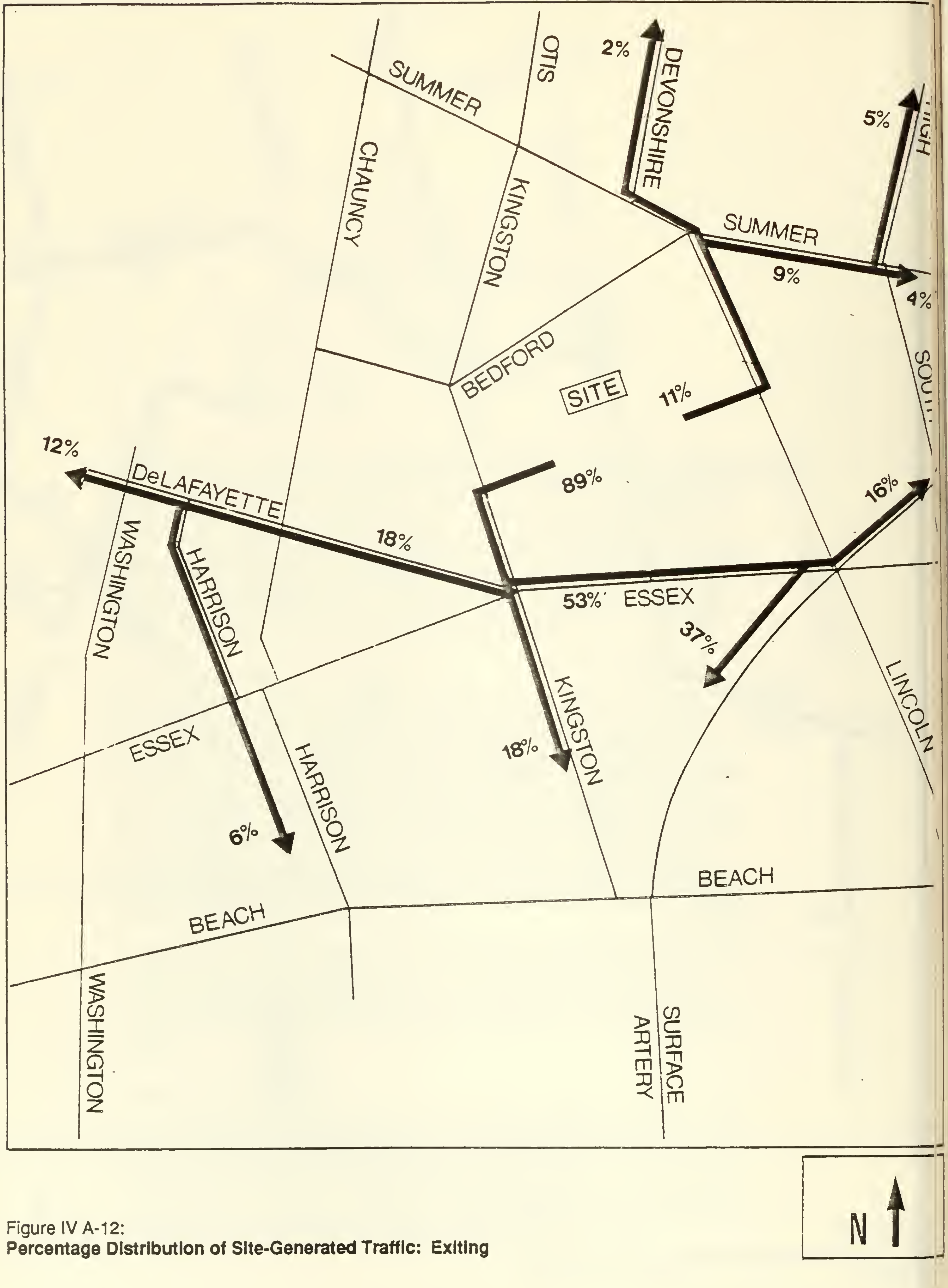


Figure IV A-12:
Percentage Distribution of Site-Generated Traffic: Exiting

TABLE IV A-13

Derivation of Public Transportation Trip Assignment for Project and Background Development Trips

Line/Direction	Est. Weekday Trips (Inbound)	Percent of Mode	Percent of Total
Red/North	56,550	26.0	16.4
Red/South	60,400	27.6	17.5
Blue/North	35,950	16.5	10.4
Orange/North	27,550	12.7	8.0
Orange/South	37,050	17.0	10.8
Total Transit	217,500		63.0
Green/West	71,414	88.4	15.9
Green/East	9,405	11.5	2.0
Total Streetcar	80,819		18.0
Commuter Rail North	14,078	44.4	4.0
Commuter Rail South	17,643	55.6	5.0
Total Commuter Rail	31,72		19.0
Turnpike Ex. Buses	4,600	18.1	1.8
Other Buses	20,862	81.9	7.9
Total Bus	25,462		9.7
Commuter Boat	1,903		0.3
Total	712,907		100.0

Source: MBTA, Ridership and Service Statistics, Operations Directorate, Planning Division, October, 1988 (complied from individual tables and figures within the text)
Boston Proper Cordon Count, City of Boston, 1982

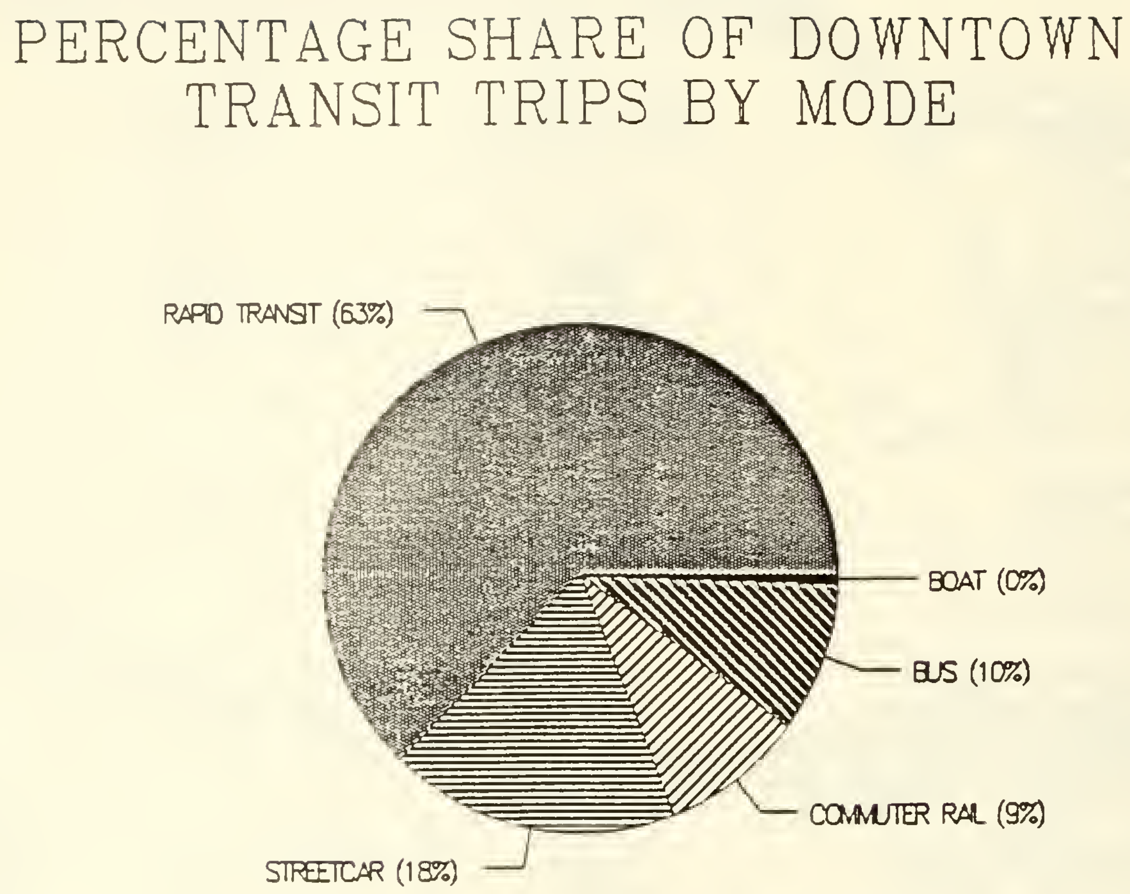


Figure IV A 13:
Passenger Share of Downtown Transit Trips by Mode

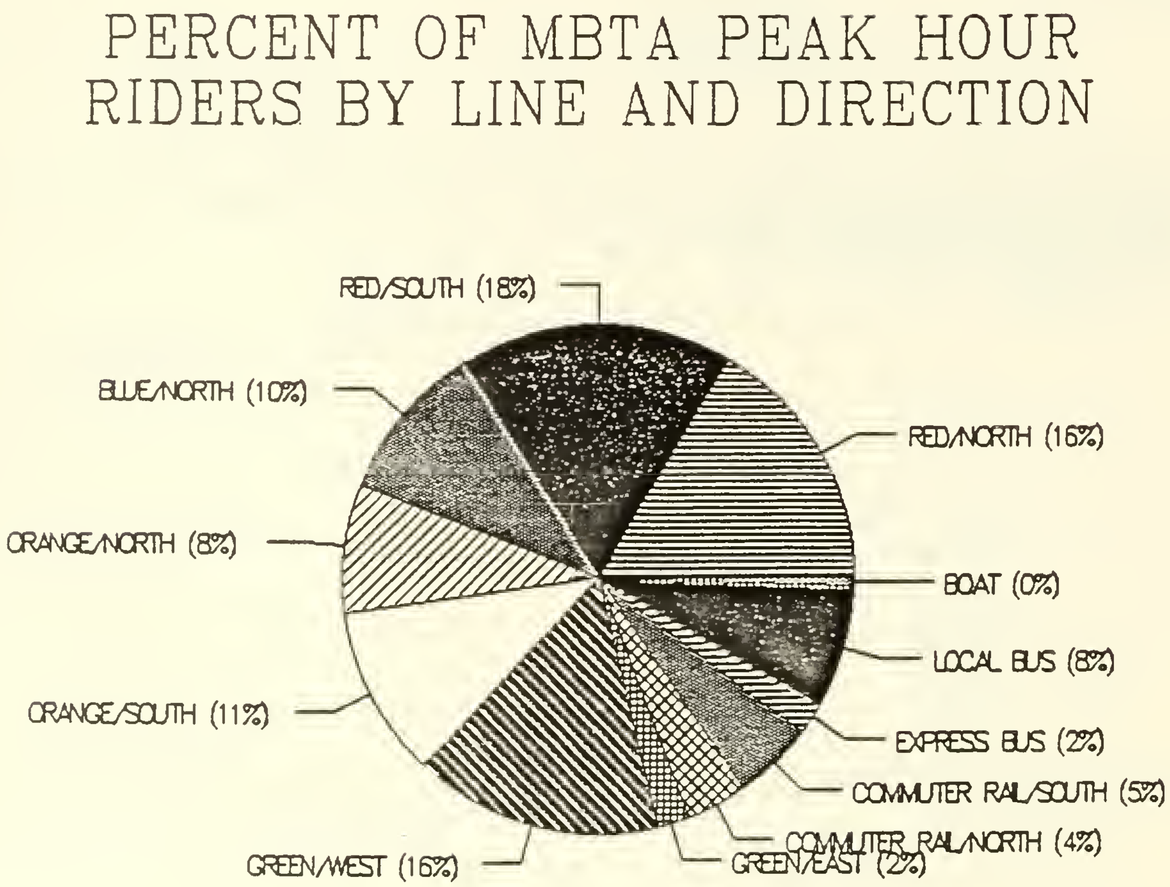


Figure IV A-14:
Percent of MBTA Peak Hour Riders by Line and Direction

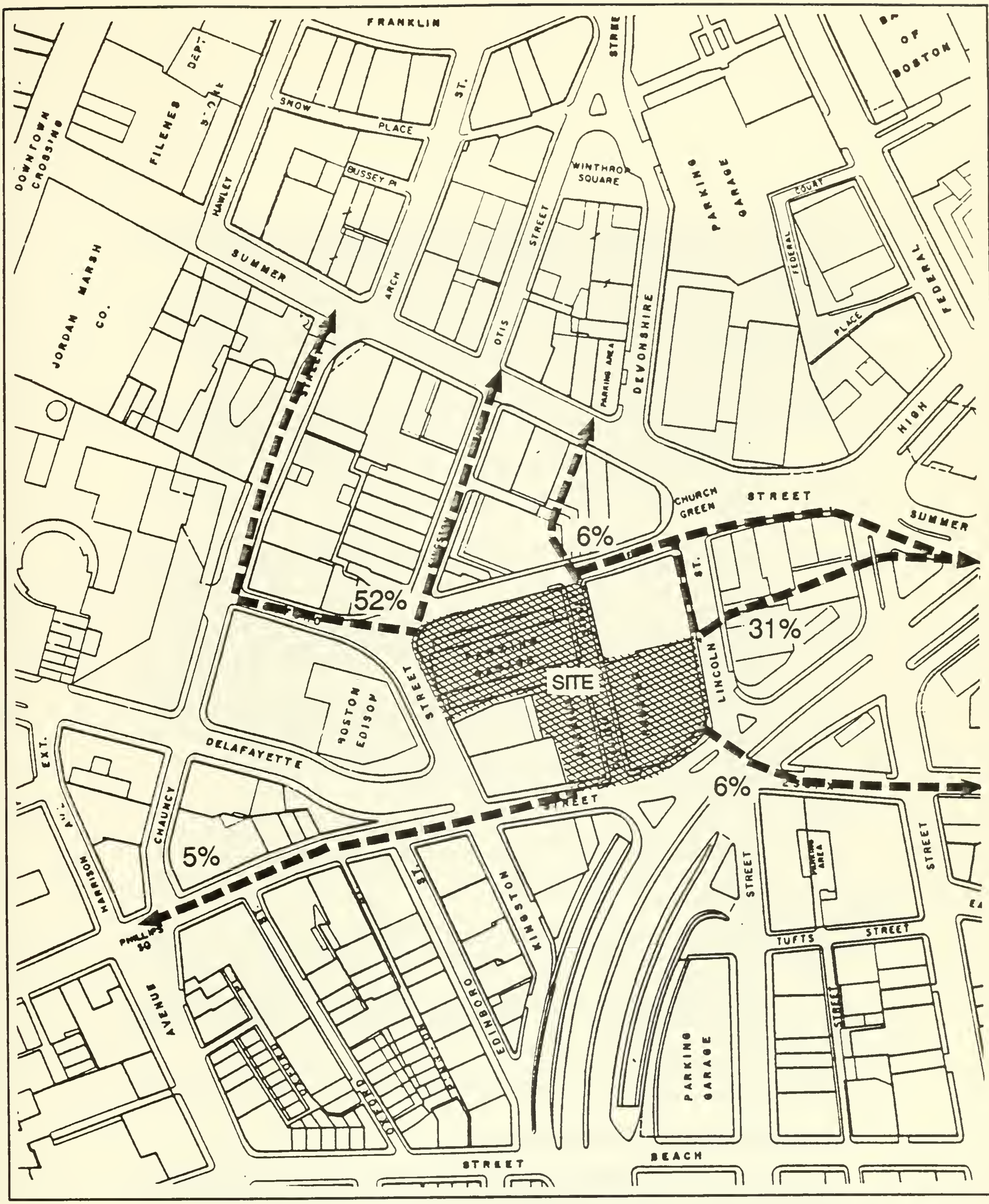


Figure IV A-15:
Pedestrian Trip Distribution
(DEVELOPER'S PROPOSAL)

For each option, a principal entrance at the Kingston-Bedford corner is expected to accommodate about 63% of total daily pedestrian trips for the 400 ft. Tower, the 325 ft. Tower, and the 250 ft. Tower, because it is the most convenient entrance for access both to the Downtown Crossing shopping district and to the Downtown Crossing MBTA station. For the Expanded Site and the Developer's Proposal, which can accommodate entrances due to the larger parcel size, this entrance would account for about 52% of total daily pedestrian trips.

- For each option, another major entrance would be provided at the corner of Lincoln and Essex Streets. The Lincoln-Essex entrance, which is a primary link to Chinatown and the Leather District, would account for about 37% of total trips for the 400 ft. Tower, the 325 ft. Tower, and the 250 ft. Tower, about 36% for the Expanded Site, and about 6% of total daily pedestrian trips for the Developer's Proposal.
- For the Developer's Proposal, another entrance would be provided midblock on Lincoln Street between Essex and Summer Streets. It is possible that this entrance would connect an enclosed arcade through the Kingston-Bedford-Essex Street project to a similar arcade through 125 Summer Street. Retail uses could be located along the arcade in each building. It is estimated that the Lincoln Street arcade entrance would be the primary route to and from the site and South Station, especially in inclement weather. Although the crossing is not controlled by a signal, its route to South Station is much more direct, and it is weather protected. This entrance thus is projected to account for 35% of the peak hour transit commuter trips. Overall, this entrance is estimated to account for about 30% of total daily pedestrian trips.
- For the Expanded Site and the Developer's Proposal, a connection also could be provided midblock on Bedford Street between Lincoln and Kingston Streets to connect to the entrance to 99 Summer Street. It is estimated that this entrance also would account for about 6% of total daily pedestrian trips.
- For the Expanded Site and the Developer's Proposal, a fifth entrance is to be provided near the corner of Essex and Kingston Streets. This would be the primary entrance serving the Chinatown and Boylston (Orange and Green Lines) MBTA stations. It is estimated that this entrance would serve about 5% of transit commuter trips, and 6% of total daily pedestrian trips.

Summaries of pedestrian trip distribution for each build alternative are included in the impact analysis below.

Probable Impacts of the Alternatives

The analysis of project related traffic impacts requires the assessment of future study area traffic volumes and circulation patterns for the 1993 analysis year. Existing traffic plus non-project traffic additions in the analysis year form a no-build baseline traffic condition against which the project generated traffic impacts are to be assessed. The expected street circulation patterns and their associated diversions of future traffic also form a part of the estimation of background traffic growth.

Development through the 1993 analysis year, both within and adjacent to the study area, was identified by the BRA. Two types of development were identified in terms of traffic impacts. First, those projects which would directly affect study area intersections by adding both local and regional trips, such as Boston Crossing and Commonwealth Center, were identified. Then, projects sufficiently distant from the Kingston-Bedford-Essex Street project that the regional component of vehicle trip generation would not directly influence traffic conditions at study area analysis locations were identified. For example, the regional traffic component of trips generated by the International Place and 125 High Street developments are expected to exit the regional highway network at locations north of the study area. Local traffic generated by these developments, however, may impact intersections adjacent to the Kingston-Bedford-Essex Street project.

The estimation of future year traffic levels was therefore assessed through carrying out the following steps:

1) First, the effects of new street circulation patterns on traffic at study area locations were identified.

2) Development scheduled for completion between 1988 and the design year (1993), as identified by BRA, was then obtained, and classified into direct impact projects and background impact projects as described above.

3) Then, in order to establish growth factors for the background projects, downtown floor space totals by zone and land use were summarized from 1986 Central Transportation Planning Staff (CTPS) data. This year was chosen as the base year because it was the most recent year for which comprehensive data by zone were available. Projects completed between 1986 and 1988 were added to the 1986 totals to obtain a 1988 base condition.

4) Vehicular trip generation was then estimated for both types of projects.

5) For the direct impact trips, specific percentage distribution of traffic on routes to and from each project for local and regional traffic was identified. The total vehicle trips were then assigned to intersections based on these percentages, and finally added to study area intersection turning movement volumes.

6) Finally, the background traffic growth was estimated according to the percentage increase in floor space over existing conditions which is represented by the additional development. The resulting percentage increase was then applied to the intersection traffic volumes which resulted from the two steps above to obtain the No Build volumes.

Each of the steps is described in more detail in the sections below.

Study Area Proposals for Roadway Network Changes

The study area street system has been in a state of continual change to accommodate the needs of new developments in surrounding areas, to carry out long standing plans for downtown circulation, and, in the shorter term, to provide for ongoing construction activity. Long-term changes must be understood and taken into account in order to predict accurately and in a coordinated way the impacts of the Kingston-Bedford-Essex Street and other proposed downtown projects, and the shorter term changes must be understood in interpreting traffic

count data. An underlying concern is also the short- and long-term impacts of the Central Artery-Third Harbor Crossing project, both in terms of construction and post-build conditions.

For the 1993 analysis year, the following roadway network assumptions have been incorporated in the assessment of future traffic volume levels:

- Beach Street closed at the Chinatown Gate (Kingston Street and Edinboro Street open to Surface Artery);
- Avenue de Lafayette closed between Washington Street and Harrison Avenue Extension; and
- Hayward Street and Avery Street reversed (one-way westbound).

In addition, the implications of providing for a two-way widened Essex Street between South Street and Kingston Street also were examined. This long standing improvement along the Essex Street corridor that provides for the development of Essex Street as an east-west artery into the downtown area greatly improves regional access to Downtown Crossing and also serves as a relief to traffic along Summer Street, Bedford Street, Beach Street, and Kneeland Street, which currently act as the only westbound distributors to the area. When Summer Street was closed west of Chauncy-Arch Street as part of the Downtown Crossing auto-restricted zone, westbound distribution within the downtown was shifted to more circuitous routes. Today, the proposed closure of Beach Street to through traffic to aid in the unification of the Leather District and Chinatown would further restrict westbound traffic flow.

The widening of Essex Street has been under study by the City. Although there are no final plans as yet to widen the street, development projects in the area have accommodated the potential reconstruction. Five hundred feet of Essex Street between Atlantic Avenue and the Surface Artery already have been reconstructed as a two-way roadway with two continuous travel lanes in each direction and curb service lanes where possible. This section of the widening was completed in coordination with the construction of One Financial Center.

Additional work would need to occur to complete the widening, including the following measures:

- Provision of revised signalization at the intersection of Essex Street with the Surface Artery;
- Acquisition and removal of two five-story brick buildings at the northeast corner of the Essex-Kingston intersection; and
- Reconstruction of 350 feet of Essex Street between the Surface Artery and Kingston Street as a two-way roadway with two travel lanes in the westbound direction, and with two through travel lanes and a right turn lane in the eastbound direction.

Although the ramp locations for the Central Artery-Third Harbor Tunnel project were unknown at the time of this traffic operations analysis, current planning efforts provide for a reversing the direction of the Lincoln Street Central Artery ramps from a northbound off-ramp to a southbound on-ramp, and making the Surface Artery one-way southbound in the area. These changes would have implications for study area intersections, especially those along the Essex Street

and Surface Artery corridors, which are generally addressed in the sections below but are beyond the scope of detailed analysis at this time.

The design year for the Kingston-Bedford-Essex Street project (1993) will occur one year prior to commencement of Central Artery reconstruction, according to the present schedule. The scheduled completion date for the southbound section of the Central Artery is 1996.

Future Direct Impact and Background Impact Development Traffic

Proposed development through the 1993 analysis year both within and adjacent to the study area, as identified by BRA, is presented in Table IV A-14 and depicted in Figure IV A-16. The existing (1988) traffic volume levels include the developments in Table IV A-14 scheduled for completion in 1988 (101 Arch Street, 99 Summer Street, 150 Federal Street and 75-101 Federal Street). The projects were then classified into direct impact projects and background impact projects.

Developments identified to have direct traffic impacts include 125 Summer Street, Commonwealth Center (Phase I); Boston Crossing (Phases I and II) and other developments in CTPS Zones 8b, 10c, and 28. (It should be noted that Commonwealth Center Phase II and Boston Crossing Phase III are significant developments which will directly affect study area intersections; however, both projects are scheduled for completion beyond the analysis year, in 1995.) The remaining developments are included in the background impact category.

Total development floor area by land use for the study area then was summarized for the base year (1986) using CTPS data classified into zones (North Downtown - zones 1, 3, 12, & 13a and South Downtown - zones 8b & c, 9a & b, 10a, b, c, & d, 11a, b, & c, 14b, & 28). Known development occurring between 1986 and 1988, obtained from the BRA, was added to the 1986 totals to produce existing conditions land use data which would correspond to the 1988 traffic count data. Then, the identified 1988-1993 development was added to the 1988 totals to produce the design year no build floor space totals for direct impact and background impact development.

Table IV A-15 presents an estimate of the total development area by land use within the downtown area for 1986, 1988 and 1993.

Table IV A-16 presents a summary of the relative increases in development by land use within the analysis zones. Total developed square footage within the area increased by approximately 4.9 percent between 1986 and 1988. According to BRA sources, total developed floor area in the analysis zones is expected to increase an additional 19 percent by the 1993 analysis year.

During the 1988 - 1993 period the BRA estimates that total office space within the study area will increase by 19.9 percent and retail space by 21.7 percent. Hotel, cultural/recreational, and residential development is expected to increase in the area by 29.9, 13.2, and 17.4 percent, respectively. Direct impact developments account for approximately 43 percent of the total identified development within the analysis zones. The direct impact development accounts for 100 percent of additional hotel, cultural/recreational, and residential development. Approximately 84.3 percent of all retail development and 31 percent of office development are expected to directly impact study area intersection locations.

TABLE IV A-14

Development Projects Included in No Build Traffic Assignments

CTPS Zone	Year	Project	Map No.	Office (Sq.Ft.)	Retail (Sq.Ft.)	Resident. (d.u.)	Hotel (rooms)	Cult/Rec (sq.ft.)	Parking Spaces
8C	1988	101 Arch St.	1	353,000	40,000				27
9B	1988	99 Summer St.	2	240,000	20,000				70
10B	1988	150 Federal St.	3	527,000	10,000				263
10C	1988	75-101 Federal	4	550,000	15,000				140
1	1989	73 Tremont St.	9	264,000	13,000				74
8B	1989	Parkside West	8		2,400	93			94
10C	1989	125 Summer St.	6	447,000	17,000				300
13A	1989	75 State St.	7	693,000	22,000				700
14B	1989	745 Atlantic Ave.	5	158,000	6,000				153
8B	1990	Parkside at Mason	14		2,300	52			10
8B	1990	Parkside East	13		3,000	123			161
8C	1990	64-74 Franklin St.	12	79,400	9,000				
9B	1990	80 Bedford St.	10	39,000	3,000				
11B	1990	125 High St.-I	11	894,000	19,000				850
2B	1990	600 Washington	16						
31	1990	146 Boylston St.	15		18,300	41			
1	1991	45 Province St.	19	126,500	12,000				402
1	1991	Tremont Temple	17	188,500	4,000				100
8C	1991	110-120 Tremont	20	426,000	6,000				275
11B	1991	125 High St-II	11	438,000	9,000				
11B	1991	International Place-II	21	570,000	30,000				397
29A	1991	Pavilion at Park Sq.	18	75,000	25,000				200
8B	1992	Commonwealth Center-I	22					35,000	
8B	1992	Boston Crossing-I	23		520,000				est. 800
28	1992	Commonwealth Center-I	22	775,000	240,000		300		800
8B	1993	Boston Crossing-II	23	550,000					
		Total		7,393,400	1,046,000	309	300	35,000	
Downtown Area Additional:									
8B	1995	Boston Crossing-III	24	850,000					
2B	1995	Commonwealth Center-II	23	575,000	25,000			25,000	400
		Subtotal		1,425,000	25,000	0	0	25,000	
		GRAND TOTAL		8,818,400	1,071,000	309	300	60,000	

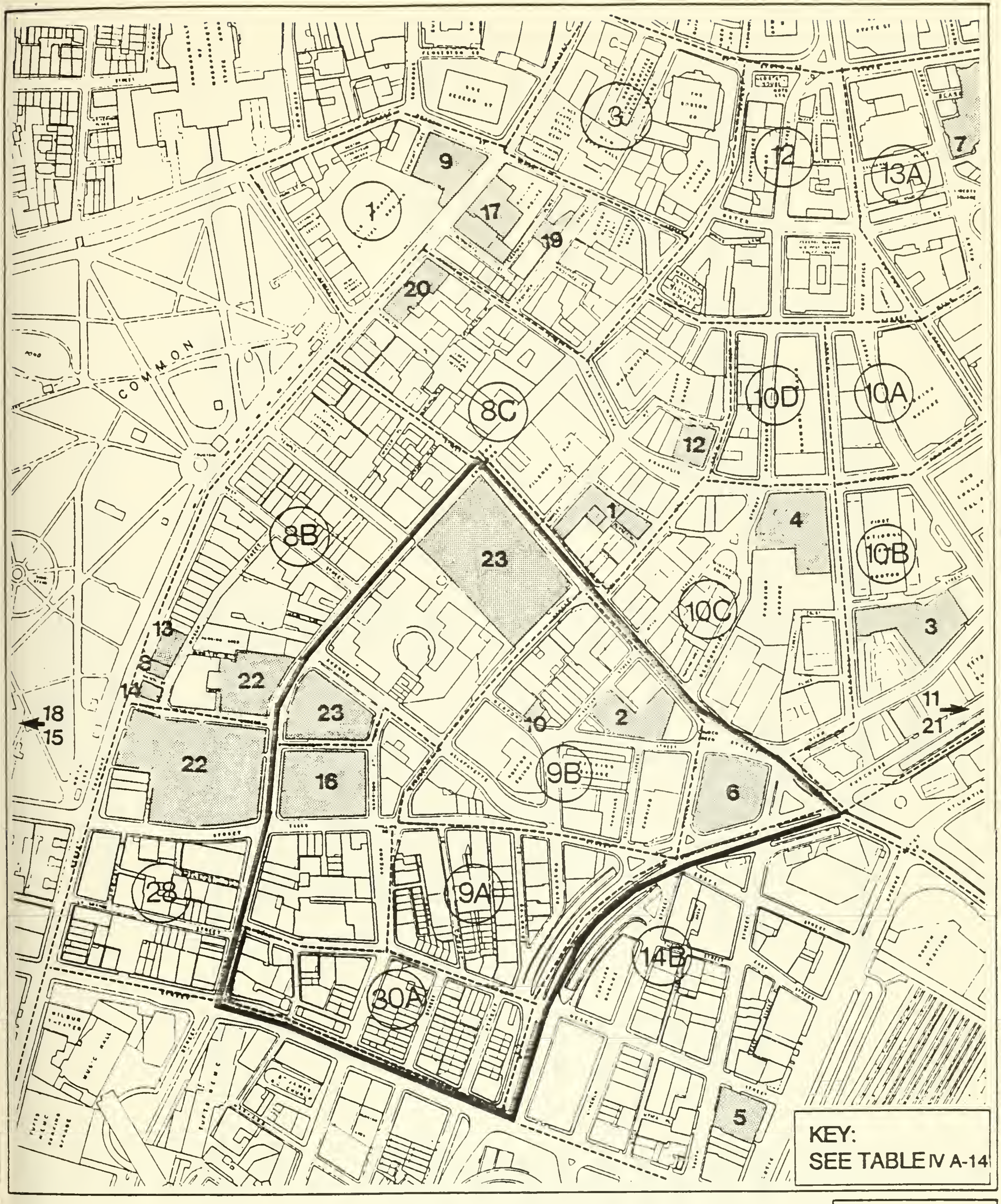


Figure IV A-16:
Design Year (1993) Background Development

TABLE IV A-15

Downtown Area Development Floor Space Totals (Sq. Ft.)

	Office	Retail	Medical	Cultural/ Educational	Recreational	Industrial	Hotel	Residential	Total
Total 1986	26,663,080	4,136,310	60,630	5,850	264,834	2,186,608	751,300	1,544,066	35,630,807
Add'l 1986-88	1,670,000	85,000	0	0	0	0	0	0	1,755,000
Total 1988	28,333,080	4,221,310	60,630	5,850	264,834	2,186,608	751,300	1,544,066	37,385,807
Add'l 1988-1993	5,648,400	917,700	0	0	35,000	0	225,000	268,000	7,094,100
Direct Impact	1,751,000	773,700	0	0	35,000	0	225,000	268,000	3,052,700
General Impact	3,897,400	144,000	0	0	0	0	0	0	4,041,400
Total 1993	33,981,480	5,139,010	60,630	5,850	299,834	2,186,608	976,300	1,812,066	44,479,907

TABLE IV A-16

Relative Increases in Downtown Area Development

	Office	Retail	Medical	Educational	Cultural/ Recreational	Industrial	Hotel	Residential	Total
Total % Increase: 1986-88	6.3%	2.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.9%
Total Projected % Increase 1988-93	19.9%	21.7%	0.0%	0.0%	13.2%	0.0%	29.9%	17.4%	19.0%
Direct Impact	6.2%	18.3%	0.0%	0.0%	13.2%	0.0%	29.9%	17.4%	8.2%
Background Impact	13.8%	3.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.8%
Direct % of Total:	31.0%	84.3%	na	na	100.0%	na	100.0%	100.0%	43.0%
Background % of Total:	69.0%	15.7%	na	na	0.0%	na	0.0%	0.0%	57.0%

Table IV A-17 identifies the expected number of person trips to the downtown area within the identified CTPS zones. These estimates are approximated using CTPS trip generation rates by land use. The relative increases in vehicle trips to the downtown study area are identified in Table IV A-18. The overall increase in vehicle trips to the area during the 1986 to 1988 period is approximately 4.1 percent, with the largest increase due to office development. Vehicle trips within the study area are expected to increase by 20.2 percent between 1988 and the 1993 analysis year. Direct impact vehicle trips account for an 11.5 percent increase over existing 1988 traffic volume levels. Other development within the study area is expected to contribute an 8.7 percent background increase to existing traffic levels.

The resulting No Build traffic volume levels for morning, evening and Saturday peak hour periods are presented in Figures IV A-17, IV A-18 and IV A-19, respectively.

Traffic Impacts

Due to the fact that the traffic generation of all five build alternatives is not significantly different (see below), analyses are presented only for the alternative that produces the highest trip generation as a worst case (400 ft. Tower). All the intermediate build alternatives have traffic impacts between those of the No Build and the highest trip generator. As will be seen, the incremental differences do not warrant showing a multiplicity of intermediate analysis results.

In the previous sections on trip generation, it can be seen that the greatest difference in directional peak hour traffic between the lowest and highest build alternatives amounts to 102 vehicles in the morning peak hour, 77 vehicles in the evening peak hour, and 31 vehicles during the Saturday peak hour. This volume disperses quickly into several directions and may be able to utilize more than one lane at various intersection approaches on its routings. It takes approximately 150 vehicles per hour <u>per lane</u> in the critical turning movements of an intersection to cause one <u>full</u> Level of Service change. The range of traffic differences between the build alternatives must be seen in this light.

As an overview to the relative contributions of existing, No Build (other project and background traffic growth), and project generated traffic (400 ft. Tower) to the traffic volumes, the total approach volumes at some key intersections for the PM peak hour are shown in Figure IV A-20 as a bar chart broken down into the three components. Although this exhibit does not differentiate between different intersection movements which vary as to number of lanes and whether a given movement is critical, the relative volume contribution to the total approach traffic is a reasonable indicator of the relative impact of each volume source. It can be seen in most cases that the No Build traffic is far greater than project traffic and that both of these are moderately small in reference to the existing traffic.

Traffic impacts for the No Build alternative and the 400 ft. Tower were analyzed for two roadway network options along Essex Street. The first reflects the existing configuration of Essex Street as a one-way eastbound segment between Kingston Street and South Street. The second assumes a widened, two-way Essex Street along this same segment. It should be noted that the most critical trip producing alternative, the 400 ft. Tower, is used to analyze both the one-way and two-way Essex Street options, even though from a purely physical point of view, this alternative does not allow for a two-way Essex Street. This has been done so that the

TABLE IV A-17

Estimated Person Trips For Downtown Area Development

	Office	Retail	Medical	Educational	Cultural/ Recreational	Industrial	Hotel	Residential	Total
Total 1986 Trips	178,643	124,917	600	77	6,806	4,811	6,536	12,507	334,896
Total 1988 Trips	189,832	127,484	600	77	6,806	4,811	6,536	12,507	348,652
Direct Impact 1988-93	11,732	23,366	0	0	900	0	1,958	2,171	40,125
Background Impact 1988-93	26,113	4,349	0	0	0	0	0	0	30,462
Total Add'l 1988-93	37,845	0	0	0	900	0	1,958	2,171	70,587
Total 1993 Trips	227,676	155,198	600	77	7,706	4,811	8,494	14,678	419,239

TABLE IV A-18

Relative Increase in Estimated Vehicle Trips to Downtown Area Development

	Office	Retail	Medical	Educational	Cultural/ Recreational	Industrial	Hotel	Residential	Total
% Increase 1986-88									
Total	6.3%	2.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.1%
Direct Impact	6.2%	18.3%	0.0%	0.0%	13.2%	0.0%	29.9%	17.4%	11.5%
Background Impact	13.8%	3.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	8.7%
% Increase 1988-93									
Total	19.9%	21.7%	0.0%	0.0%	13.2%	0.0%	29.9%	17.4%	20.2%

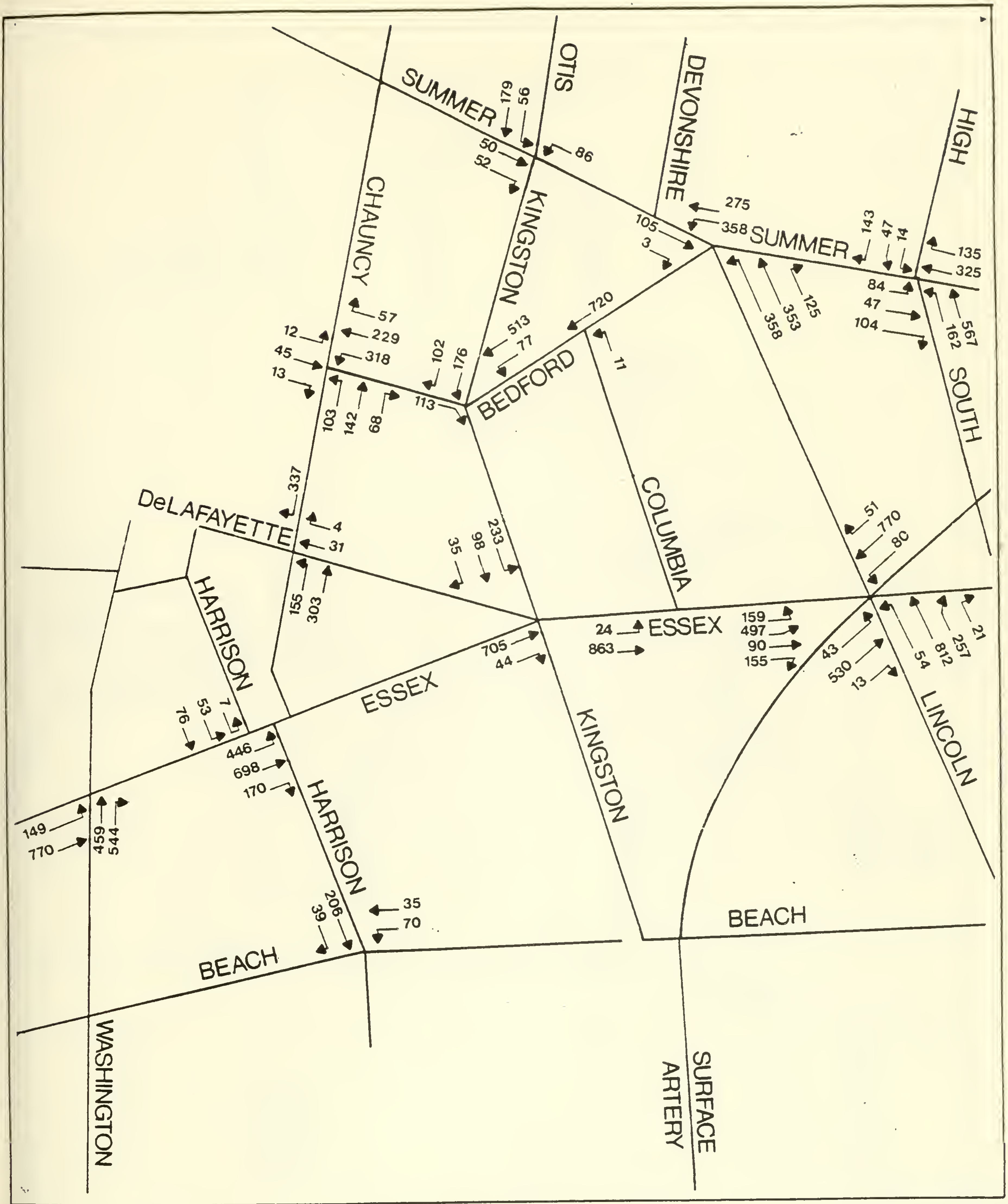


Figure IV A-17:
No Build (1993) Conditions - AM Peak Hour Traffic Volume
Existing Esseex Street - Configuration

N

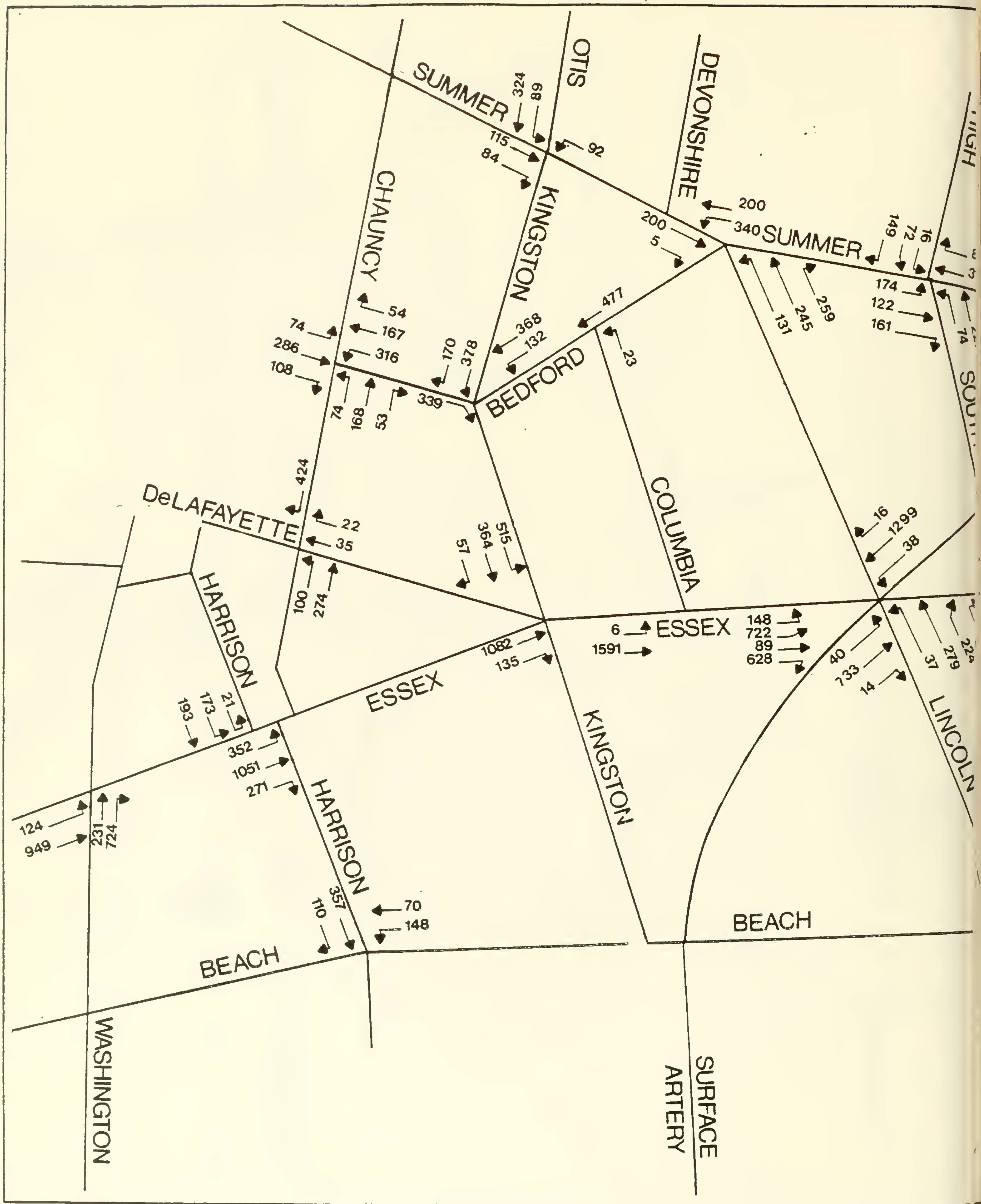


Figure IV A-18:
No Build (1993) Conditions - PM Peak Hour Traffic Volume
Existing Essex Street - Configuration

N

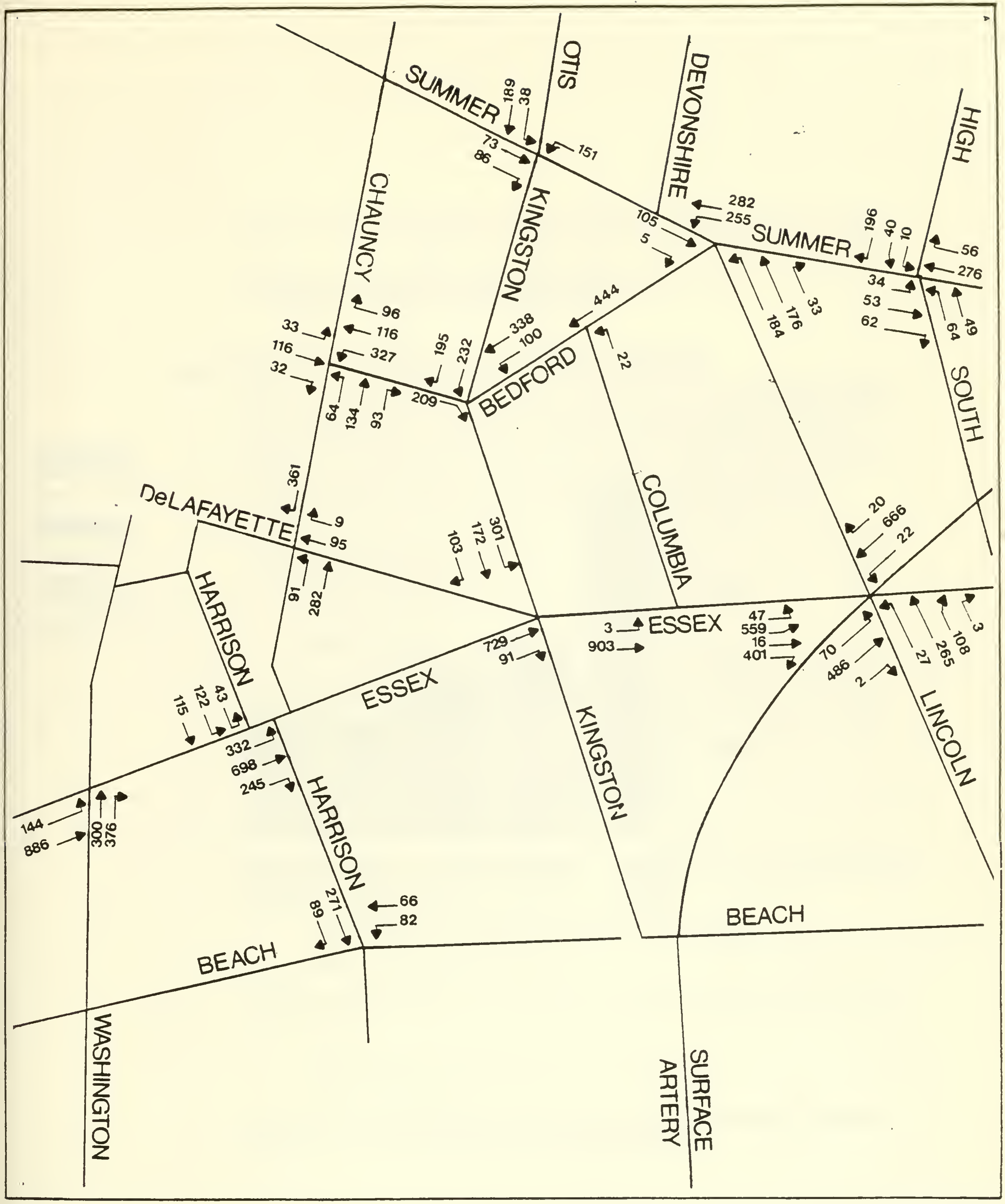


Figure IV A-19:
No Build (1993) Conditions - Sat. Peak Hour Traffic Volumes
Existing Essex Street - Configuration

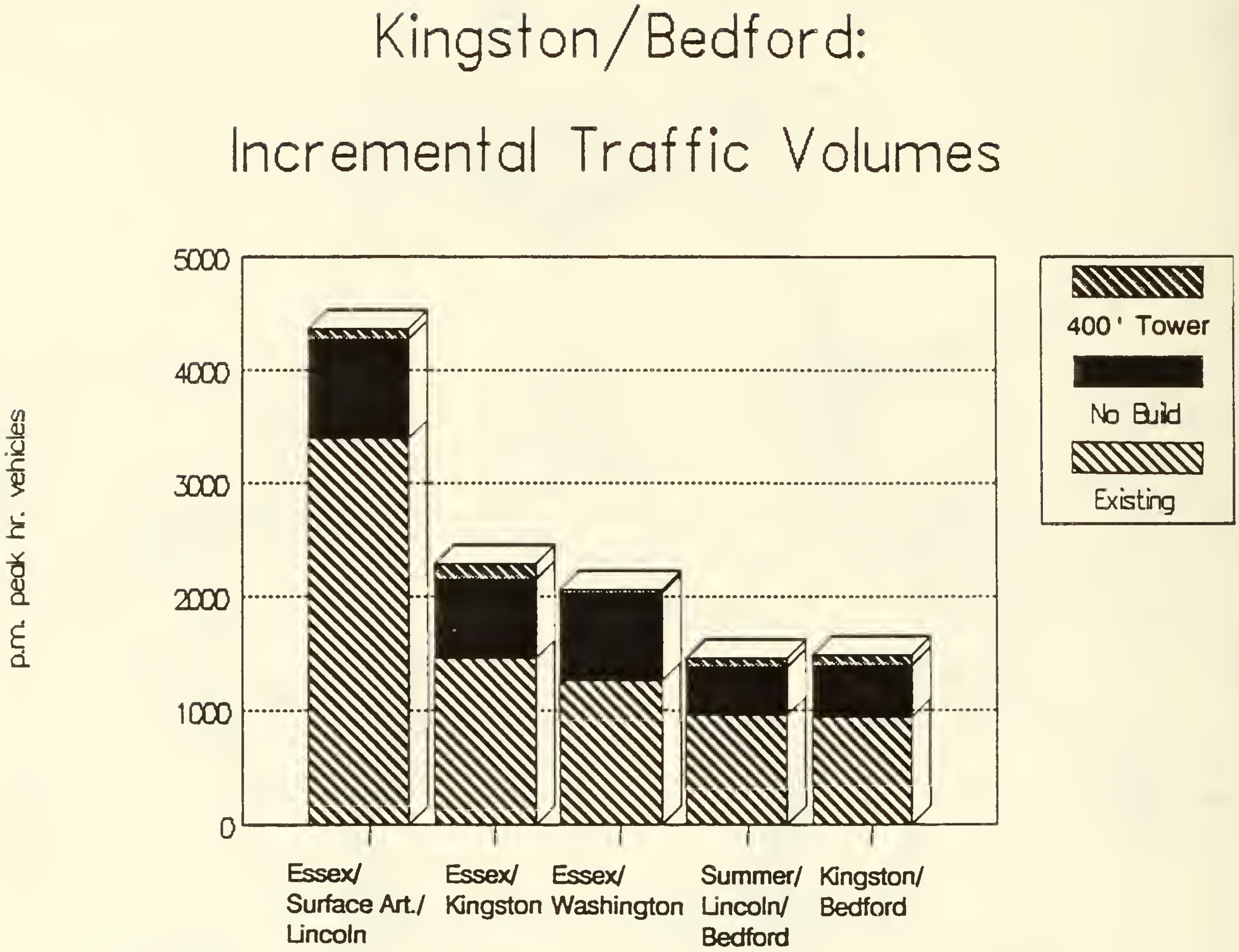


Figure IV A-20
:Kingston-Bedford: Incremental Traffic Flows

traffic analysis of Essex Street direction options may be made with the same overall street network traffic loading, to insure proper comparability and consistency.

The Level-of-Service analysis, described in the following sections, is graphically summarized on Figures IV A-29, IV A-30, and IV A-31.

No Build Traffic Impacts: Existing Essex Street Configuration

Table IV A-19 presents the expected traffic operations for No Build (1993) conditions, assuming the existing Essex Street configuration. The No Build assignment assumes the completion of Phase I and II of the Boston Crossing project and Phase I of the Commonwealth Center development. These two major projects rely heavily on Bedford Street and Washington Street for access during the morning peak hour period. During the evening peak hour period, exiting traffic produces significant pressures along and across the Essex Street corridor.

During the morning peak hour, deficient traffic operations are limited to the unsignalized intersection locations of:

- Bedford-Chauncy-Lafayette Place Garage (LOS F), and
- Essex-Harrison-Chauncy (LOS E).

In addition, the Essex-Kingston-Ave. de Lafayette intersection and the Bedford-Kingston intersections operate at LOS D during the morning peak hour period.

During the evening peak hour, unacceptable traffic operating conditions are evident at the unsignalized intersections of:

- Bedford-Kingston (LOS F), and
- Essex-Kingston-Ave. de Lafayette (LOS F);

and are also evident at the two intersections which operate poorly in the morning, i.e.:

- Bedford-Chauncy-Lafayette Place Garage (LOS F), and
- Essex-Harrison-Chauncy (LOS F).

In addition, unacceptable traffic operating conditions are evident at the signalized intersections of:

- Essex-Surface Artery-Lincoln (LOS F), and
- Essex-Washington (LOS E).

The Summer-Lincoln-Bedford intersection approaches unacceptable operating conditions during the evening peak hour period (LOS D).

TABLE IV A-19

No Build (1993) Conditions - Traffic Operations Summary (Existing Essex Street Configuration)

SIGNALIZED INTERSECTIONS

Intersection Location	AM Peak Hour LOS	AM Peak Hour Average Delay	PM Peak Hour LOS	PM Peak Hour Average Delay	SAT Peak Hour LOS	SAT Peak Hour Average Delay
Summer-High-South	B	12.51	B	7.44	B	7.75
Summer-Lincoln-Bedford	B	11.81	D	29.23	B	9.76
Summer-Otis-Kingston	B	6.84	B	7.11	B	7.17
Essex-Surface Artery-Lincoln	C	17.14	F	74.12	D	34.67
Essex-Washington	B	12.74	E	57.31	B	10.13

UNSIGNALIZED INTERSECTIONS

Intersection Location	AM Peak Hour LOS	AM Peak Hour Reserve Capacity	PM Peak Hour LOS	PM Peak Hour Reserve Capacity	SAT Peak Hour LOS	SAT Peak Hour Reserve Capacity
Bedford-Columbia						
Columbia NB	C	275	A	537	A	465
Bedford-Kingston						
Kingston SB	D	163	F	0	E	92
Bedford-Chauncy-LP Garage						
Lafayette Ent. EB	A	580	D	198	A	510
Bedford WB	F	0	F	0	F	0
Essex-Kingston-Ave. de Lafayette						
Kingston SB						
LT	D	118	F	0	E	17
TH	B	343	F	0	C	234
Essex-Harrison-Chauncy						
Harrison SB						
LT	E	18	F	0	F	0
TH	E	23	F	0	F	0
Harrison-Beach						
Beach WB	A	625	C	239	B	395

The same unsignalized intersections that operate poorly during the evening peak hour also exhibit unacceptable LOS during the Saturday peak hour period, namely:

- ° Bedford-Kingston (LOS E),
- ° Bedford-Chauncy-Lafayette Place Garage (LOS F),
- ° Essex-Kingston-Ave. de Lafayette (LOS E), and
- ° Essex-Harrison-Chauncy (LOS F).

The signalized intersection of Essex-Surface Artery-Lincoln approaches unacceptable operating conditions during the Saturday peak hour period (LOS D).

No Build Traffic Impacts with Mitigation

The degradation of traffic operations at study area intersections for No Build conditions has been assumed for this study to be mitigated by other development projects or by the City. The results of expected mitigation measures of No Build traffic impacts to improving traffic operations at signalized study area intersections are presented in Table IV A-20.

As shown in the table, traffic operations can be improved to acceptable levels at the Essex-Surface Artery-Lincoln intersection through channelization within the existing right-of-way along the Essex Street approach (reserved right turn lane from Kingston Street to Surface Artery) and signal rephasing to facilitate right turns.

Traffic operations during the evening peak hour period at the Essex-Washington intersection can be improved to almost acceptable levels (LOS E, close to LOS D) with the installation of pavement markings designating eastbound lane movements (left turn/through, through, through) and through the institution and enforcement of peak hour parking restrictions along the eastern Essex Street section between Washington Street and the Surface Artery.

Signalization is the assumed mitigation measure for the unsignalized intersections that operate poorly under No Build Conditions. For these poorly operating unsignalized locations, the addition of signalization would bring operating conditions to acceptable levels during all peak hour periods, as shown in Table IV A-21.

400 ft. Tower Traffic Impacts: Existing Essex Street Configuration

For the existing Essex Street configuration, the 400 ft. Tower traffic volume levels are presented in Figures IV A- 21, IV A-22 and IV A-23 for the morning, evening, and Saturday peak hour period, respectively. It should be noted that the 400 ft. Tower volumes are lower than the No-Build for turning movements at several intersections. The reason for this unusual condition is that the traffic routings for the new garage with its entrances on Lincoln Street and Kingston Street will be different than routings for the old garage with its entrance on Bedford Street, particularly from the west.

Table IV A-22 indicates the traffic operations for the 400 ft. Tower assuming existing Essex Street conditions. The traffic operations analysis for the 400 ft. Tower assumes the No Build traffic mitigation measures have been instituted.

TABLE IV A-20

No Build (1993) Conditions - Traffic Operations Summary at Signalized Intersections with Improvements by Others (Existing Essex Street Configuration)

	SIGNALIZED INTERSECTIONS					
	AM Peak Hour		PM Peak Hour		SAT Peak Hour	
Intersection Location	LOS	Average Delay	LOS	Average Delay	LOS	Average Delay
Essex-Surface Artery-Lincoln	D	26.24	D	30.40	C	17.25
Essex-Washington	na	--	E	41.55	na	--

TABLE IV A-21

No Build (1993) Conditions - Traffic Operations Summary with Improvements by Others for Currently Unsignalized Intersections (Existing Essex Street Configuration)

	LOS by Time Period		
Unsignalized Intersection	AM Peak	PM Peak	Sat. Peak
Bedford-Kingston	B	B	B
Bedford-Chauncy-Laf. Pl. Gar.	C	D	B
Essex-Kingston-Ave. de Lafayette	B	B	B
Essex-Harrison-Chauncy	A	B	B

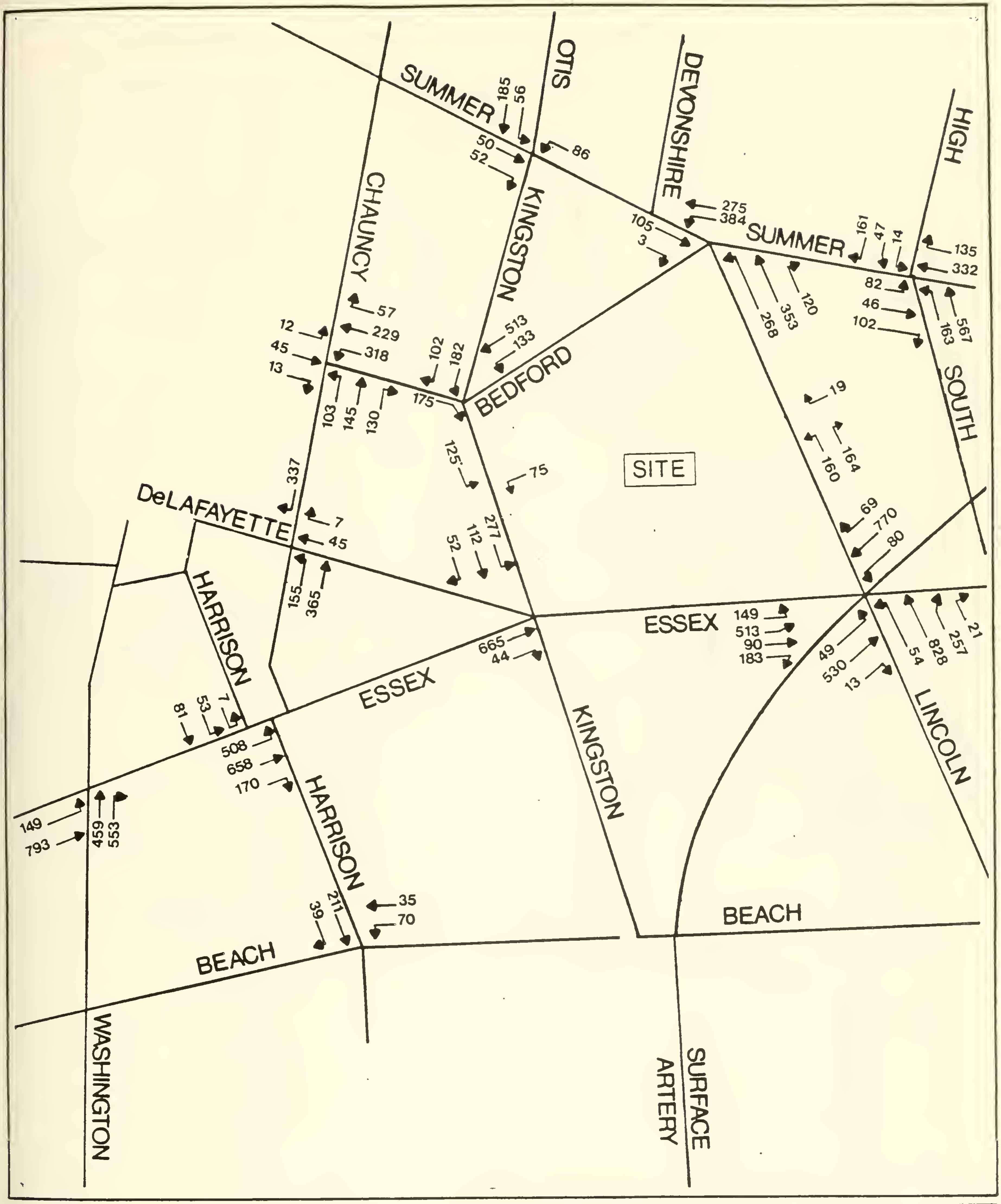


Figure IV A-21:
400 ft. Tower - AM Peak Hour Traffic Volumes
Existing Essex Street

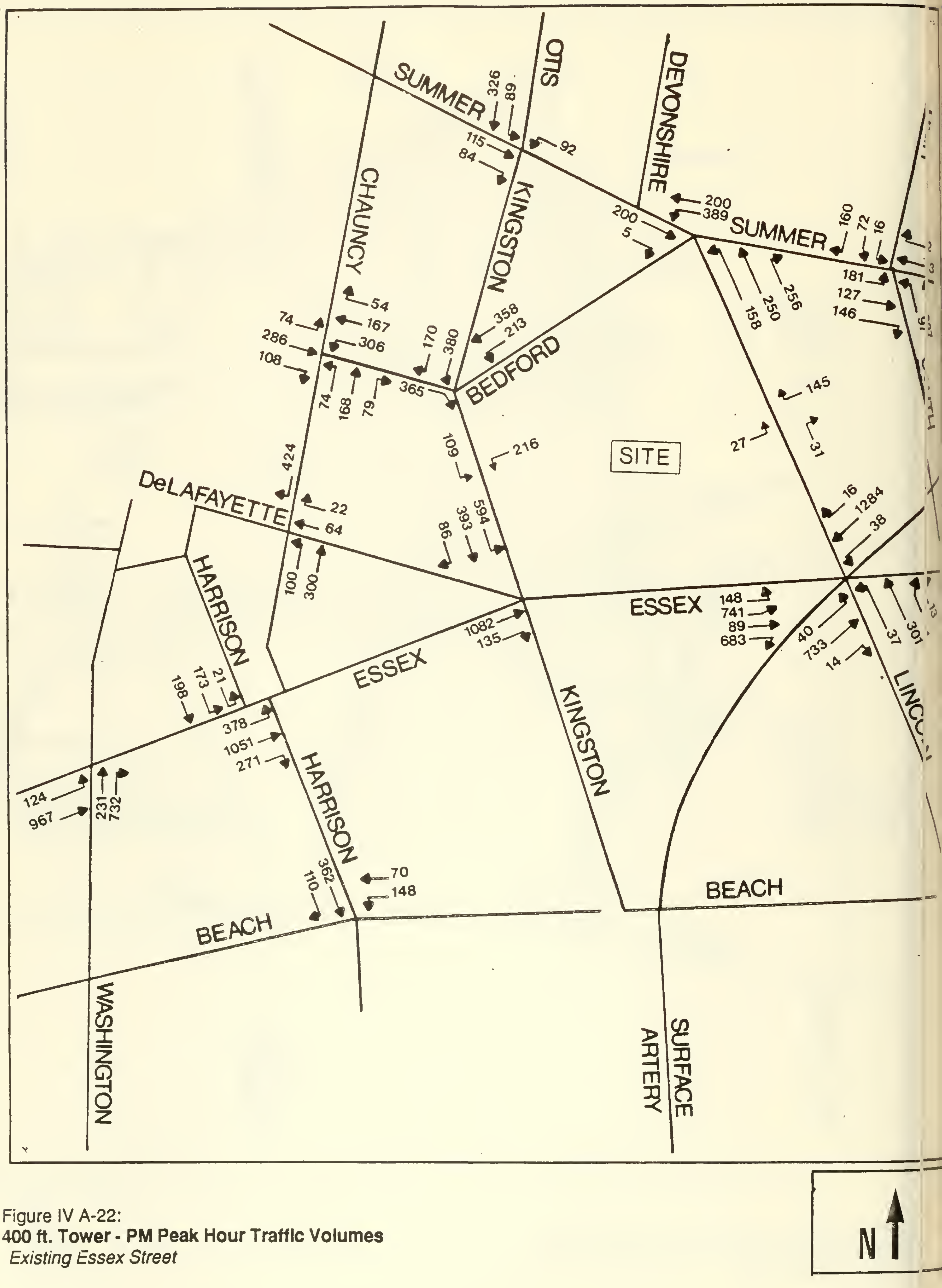


Figure IV A-22:
400 ft. Tower - PM Peak Hour Traffic Volumes
Existing Essex Street

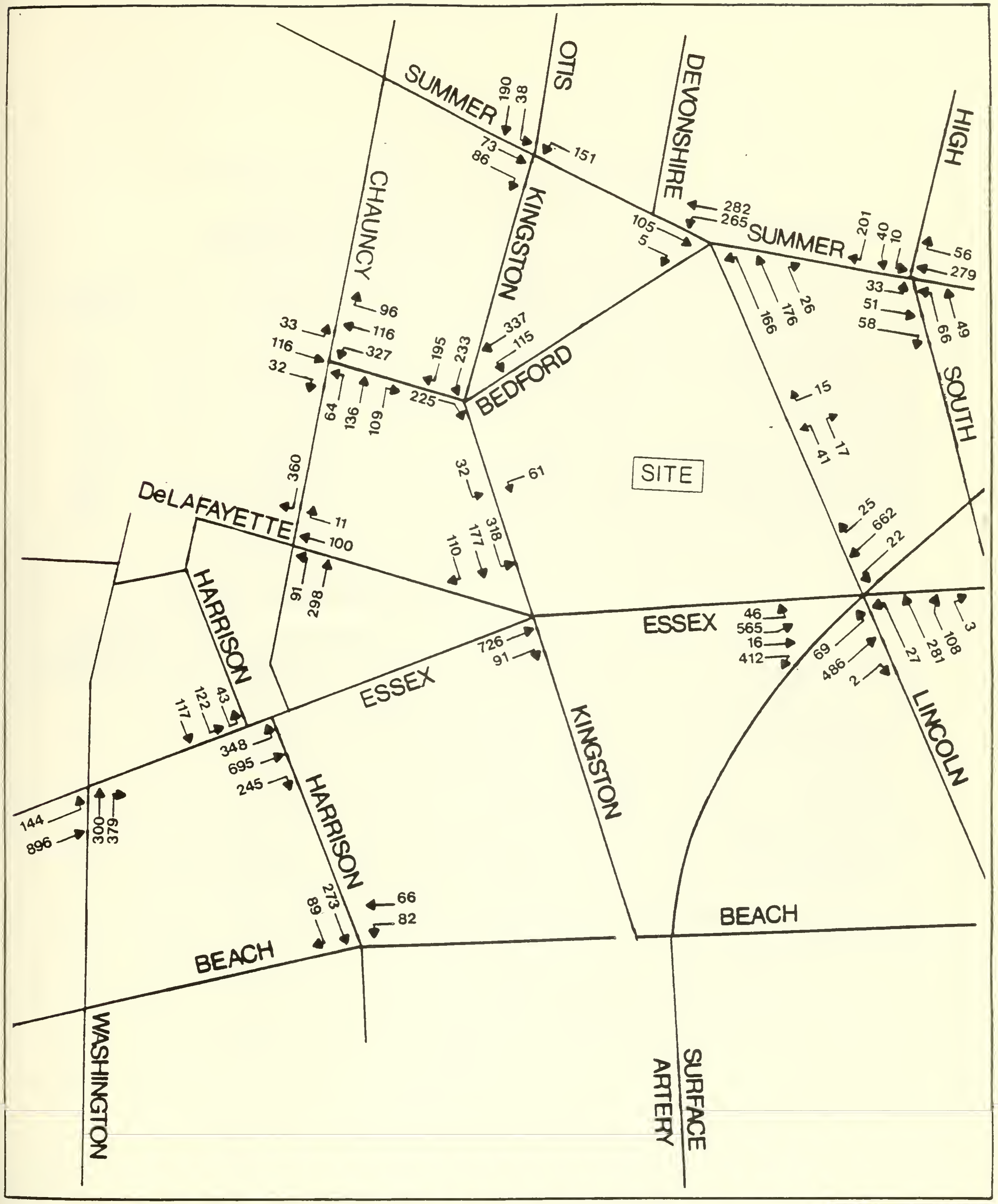


Figure IV A-23:
400 ft. Tower - Sat. Peak Hour Traffic Volumes
Existing Essex Street

TABLE IV A-22

400 ft. Tower (1993) - Traffic Operations Summary (Existing Essex Street Configuration)

SIGNALIZED INTERSECTIONS

Intersection Location	AM Peak Hour LOS	AM Peak Hour Average Delay	PM Peak Hour LOS	PM Peak Hour Average Delay	SAT Peak Hour LOS	SAT Peak Hour Average Delay
Summer-High-South	B	12.43	B	7.49	B	7.75
Summer-Lincoln-Bedford	B	11.62	D	33.10	B	9.59
Summer-Otis-Kingston	B	6.81	B	7.11	B	7.18
Bedford-Kingston	B	8.20	B	12.57	B	10.16
Bedford-Chauncy-LP Garage	C	23.87	D	29.50	C	15.67
Essex-Surface Artery-Lincoln	D	29.67	D	32.78	C	17.99
Essex-Kingston-DeLafayette	B	7.62	B	10.65	B	8.03
Essex-Harrison-Chauncy	A	3.89	B	6.33	B	7.62
Essex-Washington	B	13.57	E	44.98	B	10.26

UNSIGNALIZED INTERSECTIONS

Intersection Location	AM Peak Hour LOS	AM Peak Hour Reserve Capacity	PM Peak Hour LOS	PM Peak Hour Reserve Capacity	SAT Peak Hour LOS	SAT Peak Hour Reserve Capacity
Bedford-Columbia						
Columbia NB	B	337	A	467	A	477
Harrison-Beach						
Beach WB	A	619	C	235	B	394
Kingston-KBE Garage						
Kingston SB (LT)	A	1,179	A	1,198	A	1,271
KBE Garage	A	444	E	98	B	374
Lincoln-KBE & 125 Summer Garage						
KBE Garage	na	--	B	339	na	--
125 Summer Garage	A	889	A	756	A	981

All intersection locations in the study area operate within acceptable traffic operating conditions during all peak hour periods for the 400 ft. Tower, with the exception of Essex-Washington in the PM peak hour, which operates at LOS E. For the remaining intersections, traffic operation impacts for the 400 ft. Tower alternative remain within the same LOS designations as in the No Build conditions with the exception of Bedford-Chauncy-Lafayette Place Garage during the Saturday peak hour period, which changes from LOS B to LOS C, and Bedford-Columbia in the AM peak hour, which improves from LOS C to LOS B. At most intersections, project traffic associated with the 400 ft. Tower lengthens average vehicle delays by only a few seconds over the No Build condition.

Traffic operations for the 400 ft. Tower at the garage entrances operate at acceptable LOS during the morning and Saturday peak hour periods. Although the Kingston-Bedford-Essex Garage exit along Kingston Street operates at LOS E during the evening peak hour period, this unsignalized location experiences an average delay of approximately 37 seconds with an average queue length of 1.7 vehicles. The proximity of the signalized intersections of Bedford-Kingston and Essex-Kingston-Ave. de Lafayette should provide sufficient gaps within the traffic stream to lessen this delay.

Effects of Two-Way Essex Street on No Build and 400 ft. Tower Traffic

The two-way Essex Street roadway improvement option provides for two-way traffic operations along Essex Street from Kingston Street to Atlantic Avenue. For analysis purposes, this roadway improvement option was examined for the critical morning and evening peak hour periods only, since the Saturday peak hour traffic operations are well within acceptable levels of service for both the No Build and the 400 ft. Tower alternatives. In addition, the two-way Essex Street roadway option was examined only at those intersection locations that would be directly impacted or at those locations that are approaching unacceptable traffic operating conditions for the No Build and 400 ft. Tower alternatives. The analysis also assumed implementation of the mitigation measures previously identified under the No Build option. As noted above, for purposes of compatibility and consistency, the two-way Essex Street option was analyzed for the most critical trip-producing alternative -- the 400 ft. Tower -- even though this alternative physically would not allow for a two-way Essex Street.

<u>No Build</u>. Traffic volume levels for No Build conditions during the morning and evening peak hour periods assuming a two-way Essex Street are presented in Figures IV A-24 and IV A-25, respectively. Figure IV A-26 identifies the estimated relative increase or decrease in traffic volumes along study area roadways under No Build conditions as a result of the two-way Essex Street roadway improvement option.

This roadway improvement provides for a shift in westbound traffic into the area and does not affect the volume of eastbound traffic along Essex Street. Westbound traffic volume along the improved Essex Street between Surface Artery and Kingston Street is expected to be on the order of 700 vehicles during the morning peak hour and 450 vehicles during the evening peak hour period.

The most significant shifts in traffic resulting from the two-way Essex Street improvement option are the following:

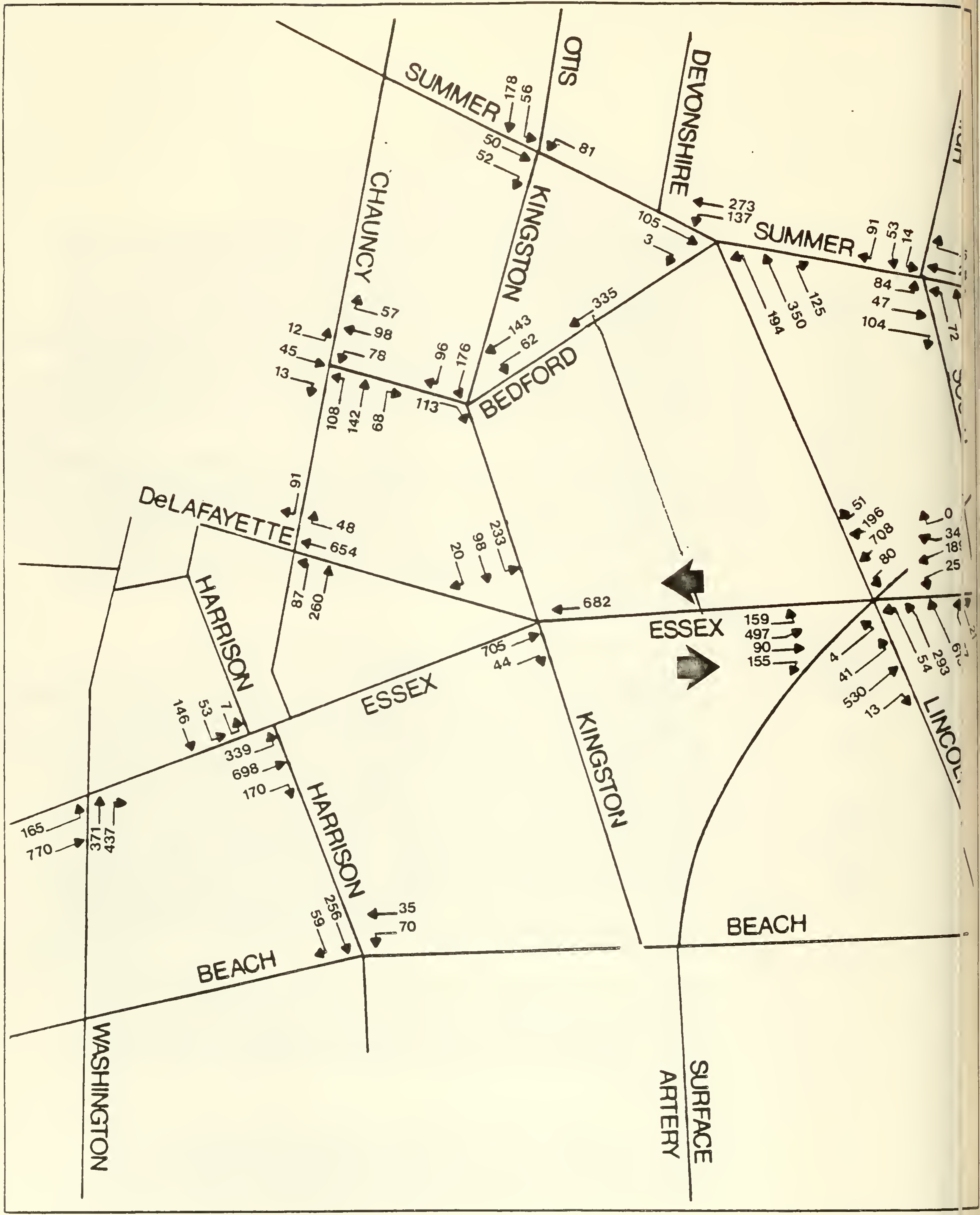


Figure IV A-24:
No Build (1993) Conditions - AM Peak Hour Traffic Volumes
Two-Way Essex Street

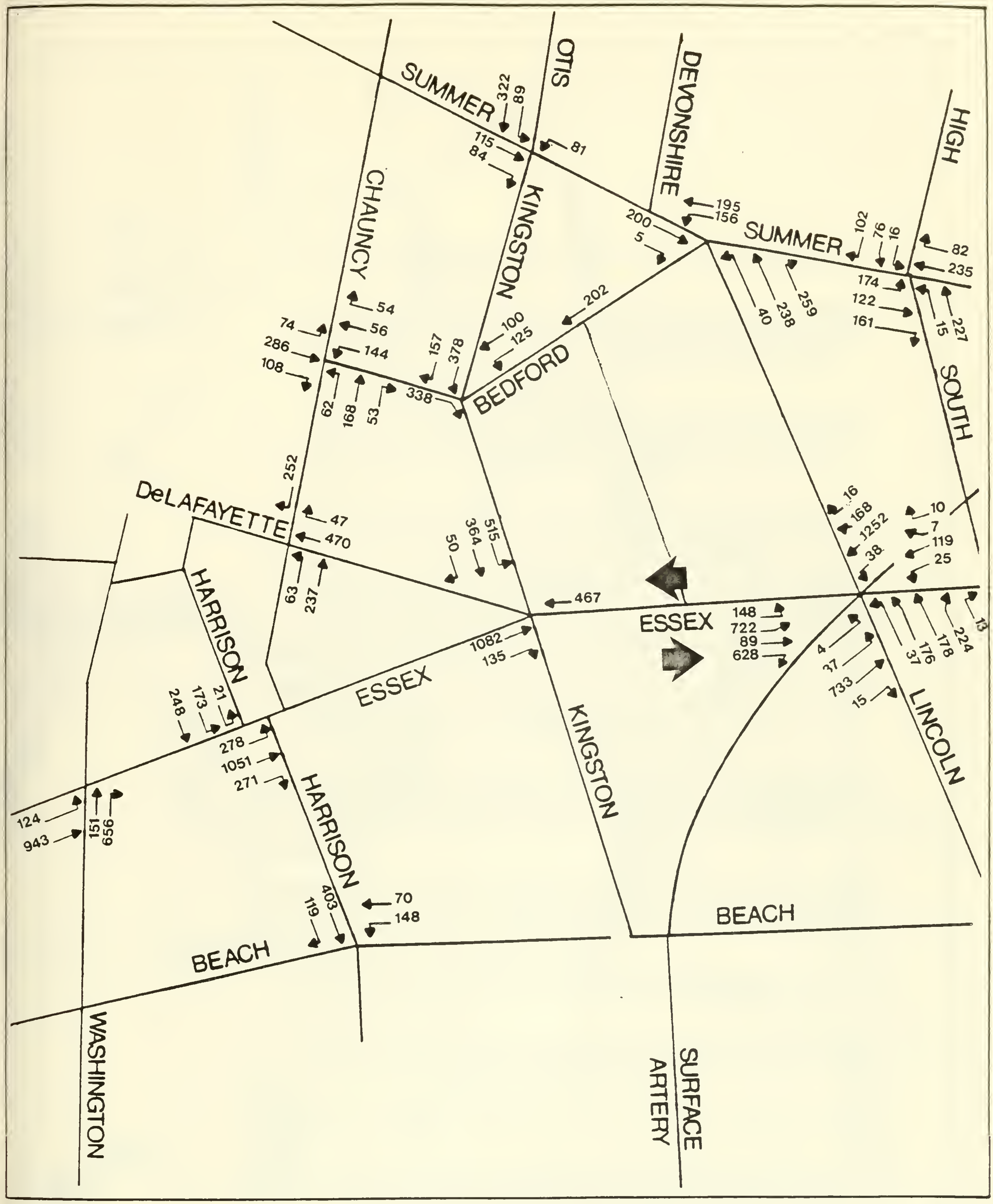


Figure IV A-25:
No Build (1993) Conditions - PM Peak Hour Traffic Volumes
Two-Way Essex Street

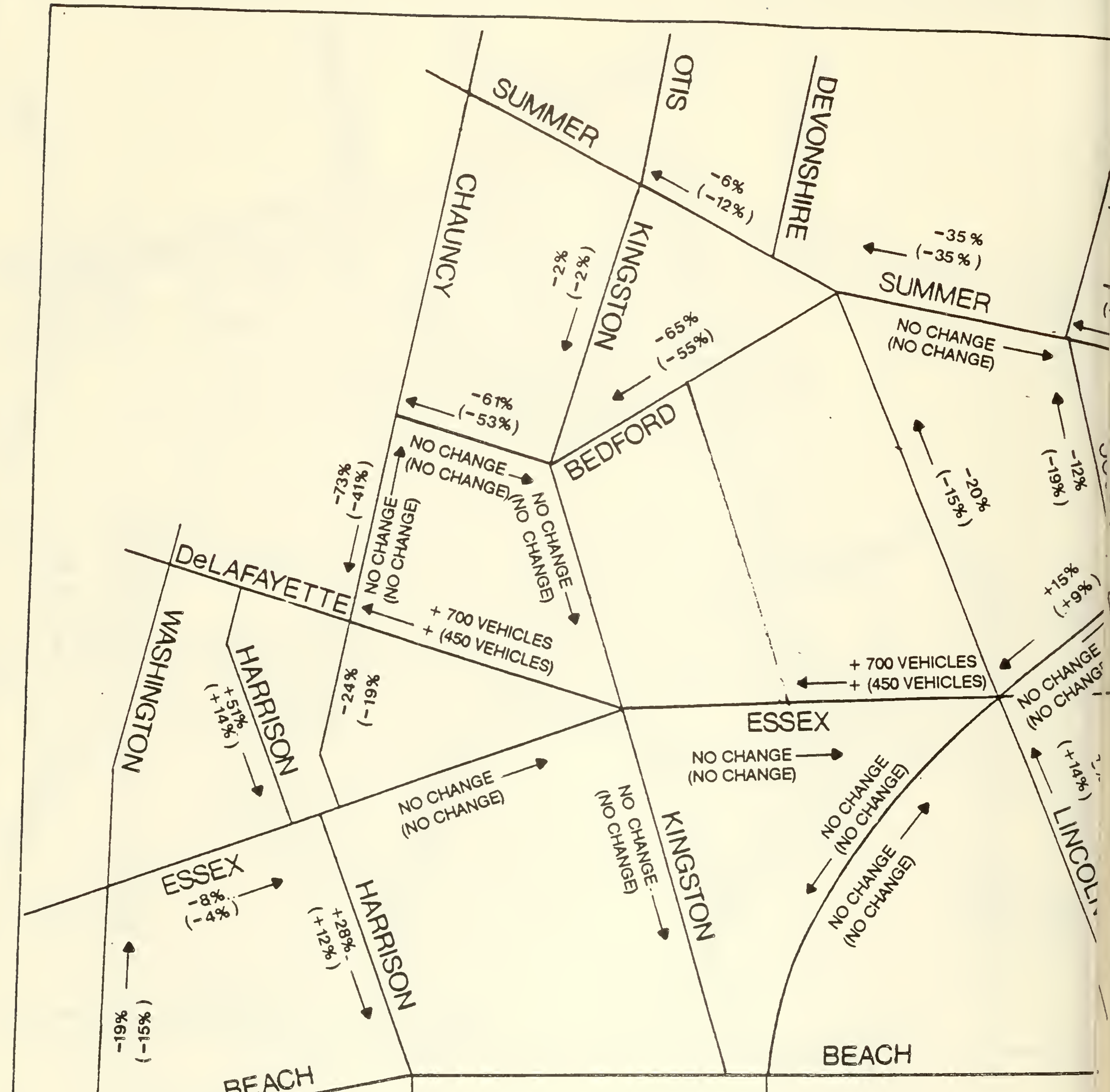


Figure IV A-26:
Relative Traffic Volumes Changes Resulting from
Two-Way Essex Street

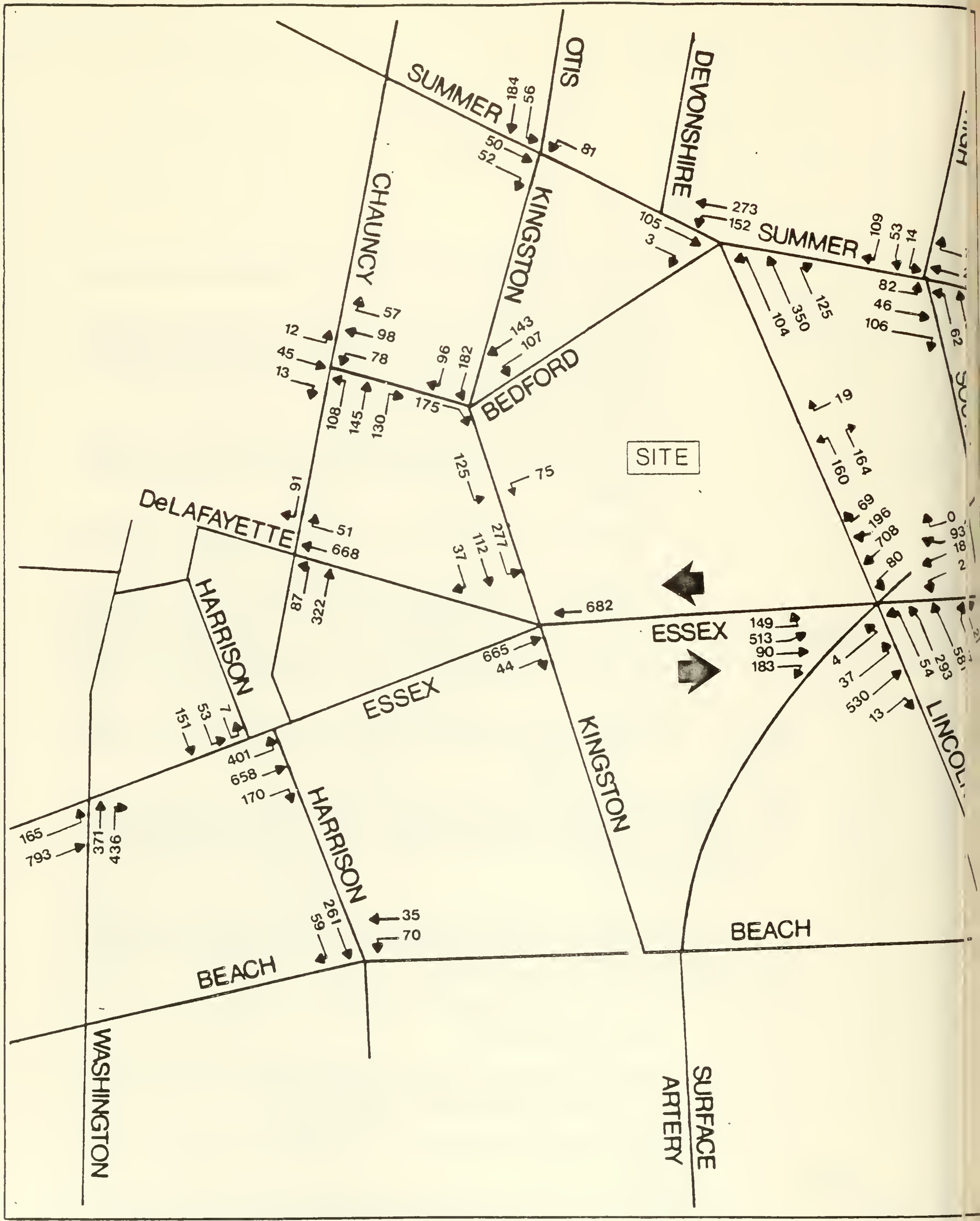
- expected increases in traffic along Avenue de Lafayette approaching Chauncy Street;
- traffic increases along Harrison Avenue between Avenue de Lafayette and Beach Street. These appear high when expressed as a percentage increase due to the low volumes of existing traffic along this section of roadway. The increases are mostly a result of improved access to Chinatown via two-way Essex Street;
- significant decreases in traffic volumes along Bedford Street, Summer Street westbound between South Street and Lincoln Street, and southbound along Chauncy Street between Bedford Street and Avenue de Lafayette;
- smaller decreases in traffic volumes north of the Surface Artery along Lincoln Street, South Street, and Summer Street westbound;
- decreased volumes along Essex Street eastbound between Tremont and Washington, particularly in the AM peak hour, due to the fact that traffic destined for Boston Crossing or Commonwealth Center parking garages can approach the area from the south by using New Essex westbound to Ave. de Lafayette westbound rather than Kneeland Street to Washington Street and then to Ave. de Lafayette eastbound; and
- decreased traffic volumes along Chauncy Street north of Essex Street to Avenue de Lafayette and Washington Street between Kneeland Street and Avery Street.

400 ft. Tower. Figures IV A-27 and IV A-28 indicate traffic volumes for the 400 ft. Tower during the morning and evening peak hour periods for the same two-way Essex Street roadway improvement option. Table IV A-23 presents the traffic operations for both the No Build and 400 ft. Tower alternatives with two-way Essex Street.

Not surprisingly, two-way Essex Street improves traffic operations at those intersection locations where traffic is significantly reduced. The average expected delay at each location improves over the existing Essex Street case during all peak hour periods at these locations, as follows:

- Summer-Lincoln-Bedford improves from LOS D to LOS C during the evening peak hour period;
- Bedford-Chauncy-Lafayette Place Garage intersection improves from LOS C and D during the morning and evening peak hours, respectively, to LOS B during both peak hour periods; and
- Essex-Washington improves from LOS E to LOS D during the evening peak hour period.

At the same time, those intersections which experience increased traffic volumes are expected to remain within acceptable traffic operational levels of service during all peak hour periods, with the important exception of Essex-Surface Artery-Lincoln where an anomaly exists, as is dealt with below.



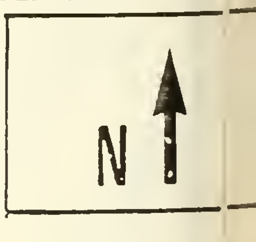


Figure IV A-27:
400 ft. Tower - AM Peak Hour Traffic Volumes
Two-Way Essex Street

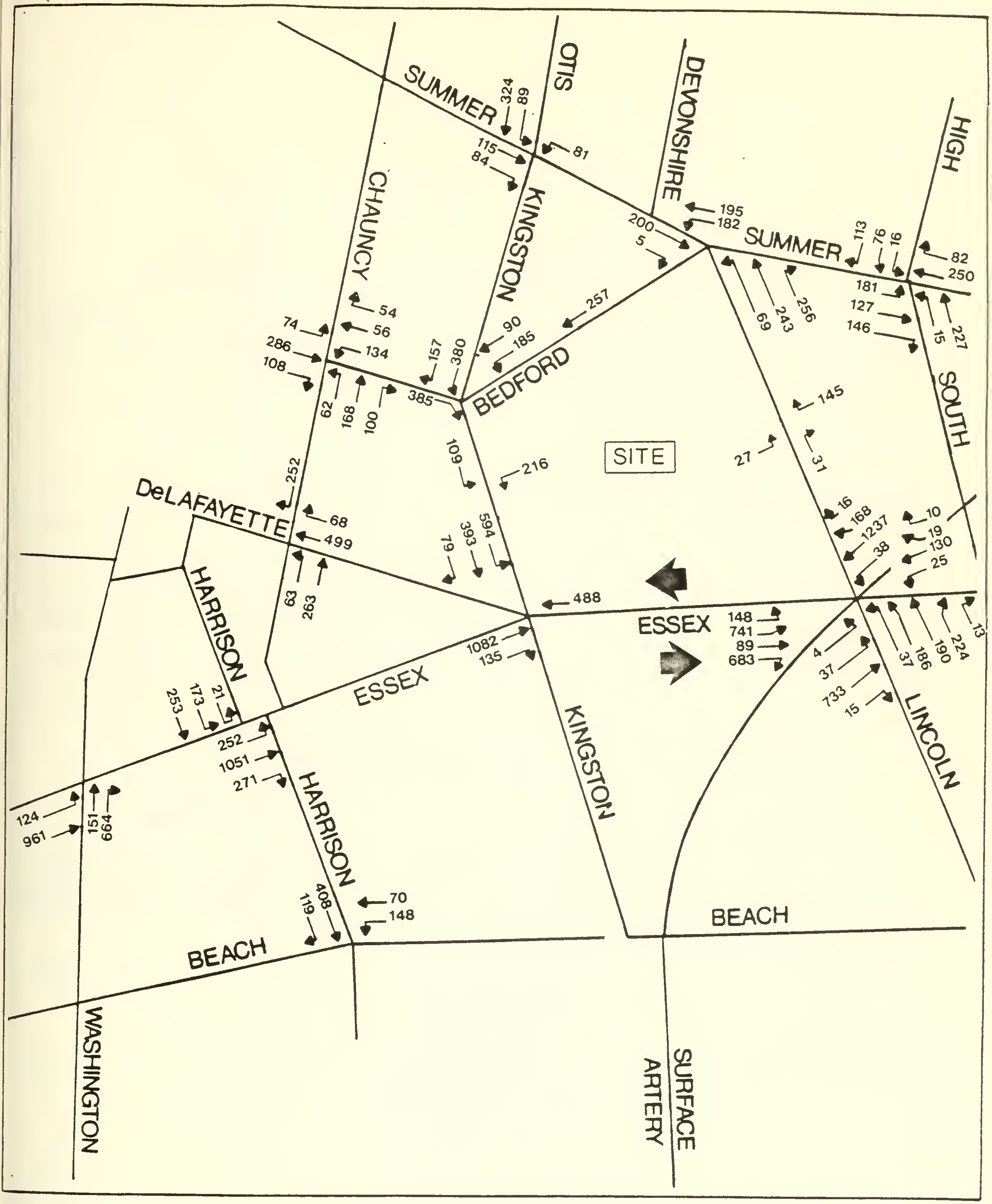


Figure IV A-28:
400 ft. Tower - PM Peak Hour Traffic Volumes
Two-Way Essex Street

TABLE IV A-23

Two-Way Essex Street - Traffic Operations Summary

SIGNALIZED INTERSECTIONS

	No Build (1993) Conditions				400 ft. Tower (1993) Conditions			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
Intersection Location	LOS	Average Delay	LOS	Average Delay	LOS	Average Delay	LOS	Average Delay
Summer-Lincoln-Bedford	B	8.87	C	17.08	B	9.13	C	17.66
Bedford-Chauncy-LP Garage	B	8.56	B	9.84	B	9.17	B	11.58
Essex-Sur. Art.-Lincoln	F	81.24	E	48.74	F	89.20	E	58.73
(with one-way Surface Artery)					(E	50.35)	(D	31.78)
Essex-Kingston-DeLafayette	B	6.40	B	10.55	B	7.15	B	12.47
Essex-Washington	B	10.13	D	28.46	B	11.66	D	30.55
Chauncy-Ave. DeLafayette	B	7.30	B	7.60	B	7.85	B	7.75

UNSIGNALIZED INTERSECTIONS

	No Build (1993) Conditions				400 ft. Tower (1993) Conditions			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
Intersection Location	LOS	Reserve Capacity	LOS	Reserve Capacity	LOS	Reserve Capacity	LOS	Reserve Capacity
Kingston-KBE Garage								
Kingston SB (LT)	na	--	na	--	A	1,172	A	1,192
KBE Garage	na	--	na	--	A	434	D	101
Lincoln-KBE & 125 Summer Garage								
KBE Garage	na	-	na	--	na	--	A	101
125 Summer Garage	na	--	na	--	A	970	A	810

Two-way Essex Street is shown to be a necessary improvement to cope with the substantial proposed background development between the Surface Artery and Tremont Street. At the intersection of Essex Street and Surface Artery, however, the creation of a two-way Essex Street does not lead traffic away from the intersection but adds volumes to it for access to the west. Without physical changes, one can only expect a worsening of LOS when a two-way condition is established. Not only does the volume increase, but Essex Street left turns which have no opposing volumes in the one-way condition must face such if the street is two-way.

This can be seen in the LOS analysis summary in Table IV A-23 where the No Build one-way Essex Street peak hour LOS of D in both the AM and PM become LOS F and LOS E, respectively, under the two-way operation of Essex Street. For the 400 ft. Tower, the comparable one-way LOS D for both peaks similarly degrades to LOS F and LOS E.

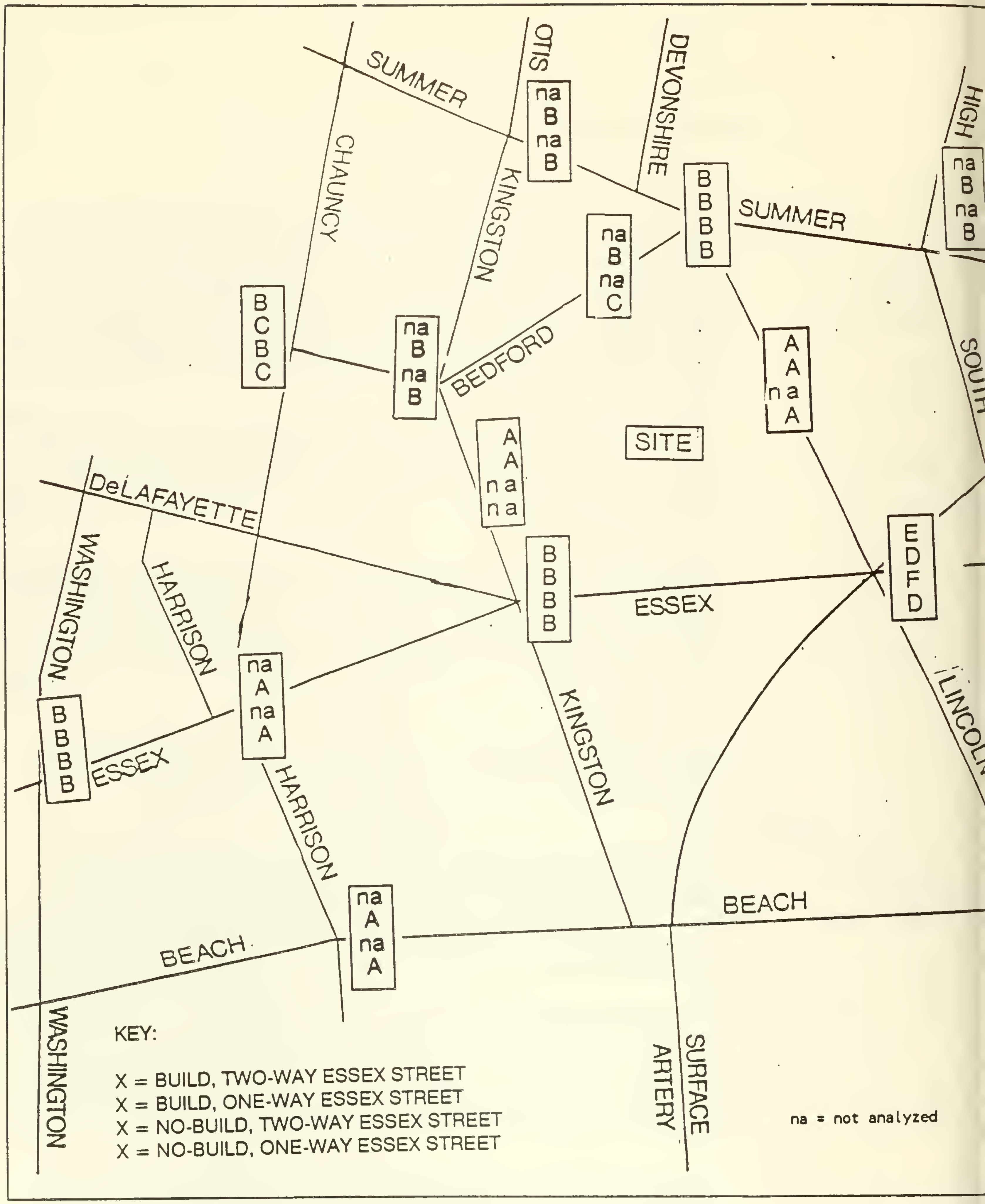
The solution to this situation can be found in the fact that practically from the inception of the proposal for a two-way Essex Street, the concept was coupled with the idea of making the Surface Artery one-way southbound, widened to four lanes, using part of the area freed up from the elimination of the northbound direction. This would allow improvement of pedestrian crossing conditions, as well as allowing a reversal of the unused Lincoln Street off-ramp to provide a southbound on-ramp in the future reconstruction of the Central Artery.

If a widened one-way southbound Surface Artery is coupled with the two-way Essex Street, LOS can be improved substantially to LOS E and LOS D in the AM and PM peak hours in the 400 ft. Tower alternative scenario, respectively. These critical condition values are shown in Table IV A-23 in parentheses.

It must be pointed out, however, that the analysis becomes more uncertain as more variations are introduced. First, the northbound direction of the Surface Artery has to be displaced somewhere, likely to some combination of Atlantic Avenue and South Street, but involving some possibility of indirect diversion to streets to the west to a small degree. The analysis showing the improved LOS did not account for the rerouting of the northbound Surface Artery, but was intended to show the improvement obtained from widening the southbound portion.

Further, the reconstruction of the Central Artery, although to be accomplished beyond the analysis year of this study, will cause significant changes in traffic in the study area dealt with herein. The rearrangement of ramps (e.g., at Lincoln Street) will also cause shifts in traffic along the Surface Artery. Improved operations on the Central Artery itself also will lead to a reduction of peak hour use of local streets in the Surface Artery corridor for traffic wishing to bypass the current peak hour congestion in and near the Dewey Square Tunnel.

In overview, the two-way Essex Street proposal is a necessary measure to serve adequately existing and future development in the study area while also serving to relieve traffic problems on other streets. The creation of a two-way Essex Street, however, worsens conditions at the Surface Artery in the short term. However, proposed Central Artery changes will probably ease congestion in Dewey Square and relieve the added burdens at Essex-Lincoln-Surface Artery.



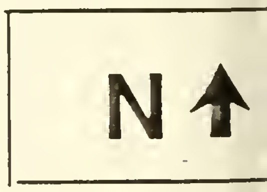


Figure IV A-29:
Comparative 1993 Intersection Levels of Service AM Peak Hour

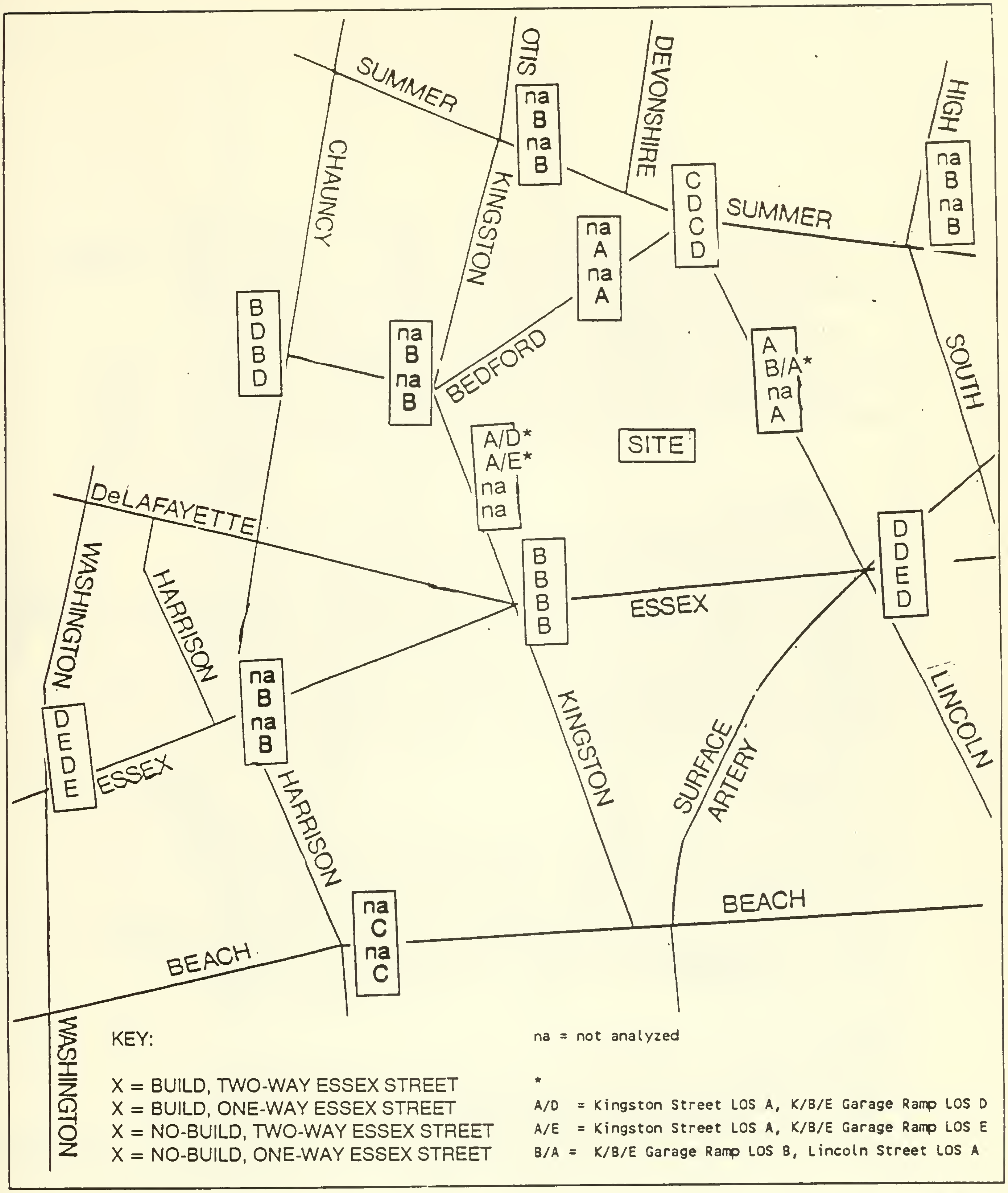


Figure IV A-30:
Comparative 1993 Intersection Levels of Service PM Peak Hour

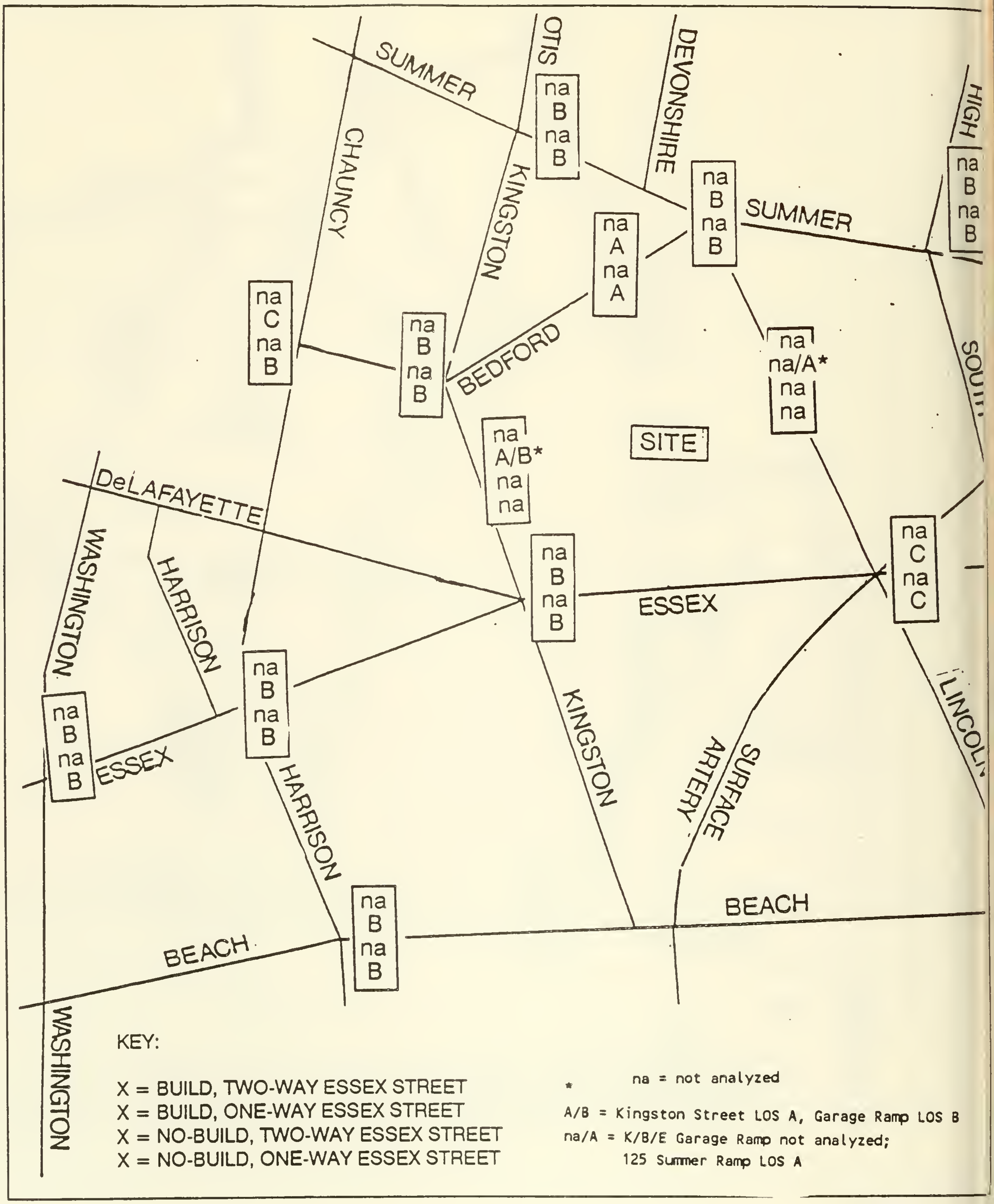


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Figure IV A-31:
Comparative 1993 Intersection Levels of Service Saturday Peak Hour

Additional Traffic Mitigating Measures

Design changes to improve the physical and operational capacity of surrounding intersections to handle development traffic are a major means of mitigating project-generated traffic impacts. However, no less important than these supply side measures are programs to help reduce the demand for auto use by employees and visitors. This can be done through several types of commute management actions, as described below. The City of Boston requires developers of major projects to enter into a Transportation Access Plan Agrement which specifies measures the developer will implement to mitigate adverse impacts of the project. Both the supply side and commute management measures would be incorporated into such an agreement.

Encourage Transit Use

The Kingston-Bedford-Essex Street development parcel's prime location at the hub of the MBTA system makes encouragement of transit use a primary mitigating measure. In the first place, the developer can stress the site's excellent transit access in the marketing materials prepared during the initial leasing process for the building. Once tenants are selected, transit access can be stressed in employment recruitment. Employment advertising by major tenants in MBTA buses and trains can help tap this work force. Once the building is operational, MBTA pass sales can be arranged on site, either in a sales office run by building management in one of the buildings or through payroll deduction by the employers. Employers can also be encouraged to offer a small subsidy of the MBTA pass; even a 25 percent subsidy (less than $10 per month) is very effective in increasing transit use.

Encourage Ridesharing

In the Boston region, developers and employers can utilize the services of CARAVAN, the regional ridesharing agency, to help initiate ridesharing programs, including carpools, vanpools, and subscription bus services. One particularly effective service which CARAVAN offers is assistance to new tenants in solving relocating employees' commute problems. This service can be utilized by the developer during the leasing process to help market the space. Once employers are located, CARAVAN will help them implement ridesharing programs and form employee carpools. The State has several funding programs in place to support private sector efforts as well.

The Kingston-Bedford-Essex Street project developer and building manager can also support ridesharing efforts through parking pricing and supply management. Beyond monthly spaces included in leases, reserving a small pool of monthly spaces for carpools and vanpools, perhaps at a slightly reduced rate, is one way to help insure ridesharing if parking availability is limited. Pricing and control of the opening hours of the supply of spaces open to the public to discourage all-day parking is also desirable.

Flexible Work Hours

Largely beyond the control of the project developer is institution of flexible working hours whereby employees can vary working schedules to avoid peak demand periods. The receptivity of employers to these types of programs varies by the type of business. Informally, the developer can distribute information about these programs to prospective tenants, and also keep track of the working hours of

major tenants during the leasing process to help coordinate schedules, if possible.

Transportation Coordinator

One key to successful implementation of these actions is an active effort by the developer to incorporate the idea of demand management into project marketing and leasing in a very positive way. This can be done through offering the services of a transportation coordinator, who can be designated from the existing management staff. This individual can work with CARAVAN to learn about available programs, prepare the required promotional materials, and launch ridesharing and transit efforts as appropriate. Once the project is fully tenanted, the function can be carried out as part of the building management on an ongoing basis.

Transportation Management Association

In the midtown area of downtown Boston, several other major projects will be in the construction and leasing stages over the same time frame as the Kingston-Bedford-Essex Street parcel. To help integrate the transportation planning for the Commonwealth Center and Boston Crossing projects with the Kingston-Bedford-Essex Street planning, the developer has already participated in joint meetings to discuss issues of common concern. This cooperative effort should continue to address ongoing issues as the projects are completed and leased.

In the long-term, this group could evolve into what is known as a transportation management association (TMA). These types of groups, which were originated by the private sector to help reduce traffic congestion in suburban California areas, typically involve developers, major employers, community groups, and public agencies with an interest in improving transportation conditions in a given district. The role for a TMA in the Kingston-Bedford-Essex Street area would include such issues as coordinating construction management for the projects, working with the City to insure the implementation of programmed street improvements, deciding on circulation options, monitoring traffic and parking conditions as the projects are leased up, and representing the area's interests with respect to major projects such as the Central Artery-Third Harbor Tunnel and future MBTA initiatives.

Parking Supply and Demand Impacts

As stated above, existing parking supply in the study area is 5,354 spaces of which 76 percent are open to the public and 24 percent are private, and of which 90 percent are in garages and 10 percent are in lots. On the Kingston-Bedford-Essex Street parcel itself, there are 731 spaces which will be displaced by the proposed development, as follows:

Kingston-Bedford Garage	550 spaces
Lincoln-Essex Lot	130 spaces
128-130 Essex Street Lot	51 spaces
Total on-site:	731 spaces

All of these spaces are open to the public, with all day rates of $9.50 per day at the garage, $12 at the 128-130 Essex Street lot, and $13 at the Lincoln-Essex Streets lot. The lot rates are at market levels for the downtown area. The garage rate is one of the lowest in the district. As noted previously, occupancy within the study area is about 88 percent of capacity at midday. While this rate does not indicate a liberal surplus of parking, it does suggest that the existing supply and demand are close to equilibrium, with the supply essentially meeting the demand.

To establish No Build 1993 parking supply and demand forecasts, the parking demand was first estimated for the design year background development and compared to net additional parking supply to be provided in conjunction with the new projects, as shown in Table IV A-24. This calculation yielded an overall deficit of nearly 1,200 spaces within the study area for 1993, excluding the Kingston-Bedford-Essex Street development.

Parking demand for each of the proposed options was then determined through applying average parking duration, arrival time, and turnover rates for each land use to the vehicle trips developed in the trip generation analysis. Work trip vehicles are assigned as all day parkers for each land use. Non-work trip vehicles are assigned a turnover rate of three for retail autos (i.e., three cars are assumed to use each space during the course of a day) and 2.67 for office non-work trips. Hotel non-work parking patterns trips are more similar to residential uses than commercial uses in that they peak in the evening. Hotel parking was thus assumed at 35 percent levels during the peak hour (approximately 2:00 PM). The resulting parking demand, compared to the proposed supply for each alternative, is shown in Table IV A-25.

As shown in the table, the 400 ft. Tower and the Developer's Proposal generate the highest parking demand at 711 and 732 spaces respectively. The 325 ft. Tower and the Expanded Site generate a demand for 613 and 627 spaces respectively, and the 250 ft. Tower for 516 spaces. Of these, demand for employee spaces ranges from a low of 367 for the 250 ft. Tower to a high of 547 spaces for the Developer's Proposal. For non-work spaces (i.e., customers and visitors), demand ranges from 149 spaces for the 250 ft. Tower to 199 spaces for the 400 ft. Tower.

Table IV A-25 also shows proposed parking supply for each build alternative, compared to the total project demand. The table also compares the new supply to the combined total needs to accommodate project demand plus replacement parking for that to be removed from the site. As shown, supply basically meets or exceeds project parking demand levels for each build alternative. However, if all the displaced parking were to be replaced on site, there would be a deficit ranging from 558 spaces for the Expanded Site to 744 spaces for the 325 ft. Tower. Added to the background deficit, this would yield a total study area deficit of 1,755 spaces to 1,941 spaces for 1993.

This parking deficit must be interpreted in light of City of Boston policies to discourage worker auto access to downtown Boston through parking pricing and supply management, and in light of MBTA policies to increase fringe parking at its outlying transit and commuter rail stations. The extent to which the City is desirous of replacing parking within the downtown, particularly for workers, is a complex policy issue.

All of these spaces are open to the public, with all day rates of $9.50 per day at the garage, $12 at the 128-130 Essex Street lot, and $13 at the Lincoln-Essex Streets lot. The lot rates are at market levels for the downtown area. The garage rate is one of the lowest in the district. As noted previously, occupancy within the study area is about 88 percent of capacity at midday. While this rate does not indicate a liberal surplus of parking, it does suggest that the existing supply and demand are close to equilibrium, with the supply essentially meeting the demand.

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TABLE IV A-24

Parking Demand Analysis: Design Year (1993) Background Development

Parameter	Hotel		Office		Retail		Total		Total
	Work	Nonwork	Work	Nonwork	Work	Nonwork	Work	Nonwork	
Daily Vehicles (in and out)	0	0	3,649	2,401	479	2,317	4,128	4,718	8,846
Round Trips	0	0	1,825	1,201	240	1,159	2,064	2,359	4,423
Peak Demand	0	0	1,825	450	240	386	2,064	836	2,900
Net New Parking Proposed:									1,703
Surplus or Deficit:									-1,197

Assumptions:

- hotel peak demand based on one space per work round trip parked during peak hour -- 2-3 p.m.
- all work trips included in peak demand
- retail nonwork divided by 3.0 turnover
- office nonwork divided by 2.67 turnover

TABLE IV A-25

Comparative Parking Demand by Land Use for Build Alternatives

	Hotel		Office		Retail		Total						
Alternative	Work	Non-Work	Work	Non-Work	Work	Non-Work	Work	Non-Work	Project Total	New Spaces Proposed	Surplus or Deficit	Project plus Re-placement	Surplus or Deficit
400 Ft. Tower	83	74	413	98	16	27	512	199	711	800	89	1,442	-642
325 Ft. Tower	66	59	354	84	19	31	439	174	613	600	-13	1,344	-744
250 Ft. Tower	55	49	293	69	19	31	367	149	516	600	84	1,247	-647
Expanded Site	83	74	333	79	22	36	438	189	627	800	173	1,358	-558
Dev. Proposal	0	0	507	120	40	65	547	185	732	900	168	1,463	-563

The difference between employee and non-work spaces influences how spaces are treated with respect to the City of Boston's parking freeze within Boston Proper. The parking freeze sets a cap on commercial parking not to exceed the level of spaces in place as of October 15, 1973. Reserved employee spaces which are not open to the general public are exempt from the parking freeze, as are residential spaces and any free customer or visitor spaces. Any spaces open to the general public for a fee are subject to the parking freeze. The freeze imposes the condition that for every new commercial space created, an existing space must be eliminated.

The Kingston-Bedford-Essex development will eliminate 731 parking spaces existing on the site in 1988. However, in October, 1973 there were actually 1,120 spaces existing on the site, as follows:

- full capacity of Kingston-Bedford mechanical garage: 735 spaces
- Lincoln-Essex Garage (a city-owned mechanical garage, later demolished, and now the Lincoln-Essex lot): 334 spaces
- 128-130 Essex Street lot: 51 spaces.

The parking freeze issue will be dealt with through the City of Boston's permitting process.

Public Transportation System Impacts

Because the site is so well located with respect to the MBTA system, public transportation is estimated to handle a significant percentage of project-generated trips. In this section, the relative impacts of these added trips on the various public transportation modes are examined.

As stated above, the concept of public transportation system capacity is complex, involving equipment availability, schedules, MBTA parking facility capacity, signal systems, maintenance, and labor force allocation issues. While it is relatively straightforward to derive a theoretical peak hour capacity, based on total vehicles and minimum schedules, other factors may make such a target unfeasible. For example, adding new cars on the shorter Green Line trains may not be possible until funds are allocated for new drivers. Similarly, because new Red Line cars are destined first toward replacing unreliable older equipment, the added system capacity is not equal to the number of new vehicles. Nevertheless, the service still is expected to improve due to increased reliability, a more difficult measure to quantify.

Given these difficulties, an attempt was made, nonetheless, to compare the relative added demands on the public transportation system made by the No Build Alternative and the five build alternatives.

- The No Build public transportation trips for design year (1993) were first allocated to the transit and bus lines according to the estimated proportion of directional volumes by line. The resulting trip distribution is shown in Table IV A-26. As shown, the background development adds 2,210 trips in the morning peak hour, increasing passenger volumes by 3.8 percent, and 2,504 trips in the evening peak hour, increasing passenger volumes by 3.7 percent. The most trips are added to the Red Line north and south, comprised of Ashmont and Braintree branches, and the Green

TABLE IV A-26

Assignment of 1993 Public Transportation Person Trips Generated by No Build Background Development and Project Alternatives

AM PEAK HOUR, PEAK DIRECTION -- INBOUND

Line/Direction	Percent Distrib.	Back-ground Trips	400 ft. Trips	325 ft. Trips	250 ft. Trips	Extended Site Trips	Devel. Prop. Trips
Red/North	16.4	362	124	103	83	101	147
Red/South	17.5	387	133	110	89	108	156
Blue/North	10.4	230	79	66	53	64	93
Orange/North	8.0	177	61	50	41	49	72
Orange/South	10.8	239	82	68	55	66	97
Green/West	15.9	351	121	100	81	98	142
Green/East	2.0	44	15	13	10	12	18
Com. Rail North	4.0	88	30	25	20	25	36
Com. Rail South	5.0	111	38	32	25	31	45
Exp. Bus	1.8	40	14	11	9	11	16
Other Bus	7.9	175	60	50	40	49	71
Commuter Boat	0.3	7	2	2	2	2	3
Total	100.0	2,210	759	630	508	616	896

PM PEAK HOUR, PEAK DIRECTION -- OUTBOUND

Line/Direction	Percent Distrib.	Back-ground Trips	400 ft. Trips	325 ft. Trips	250 ft. Trips	Extended Site Trips	Devel. Prop. Trips
Red/North	16.4	411	113	95	78	92	137
Red/South	17.5	438	120	102	83	99	146
Blue/North	10.4	260	71	61	50	59	87
Orange/North	8.0	200	55	47	38	45	67
Orange/South	10.8	270	74	63	52	61	90
Green/West	15.9	398	109	93	76	90	13
Green/East	2.0	50	14	12	10	11	17
Com. Rail North	4.0	100	27	23	19	23	33
Com. Rail South	5.0	125	34	29	24	28	42
Exp. Bus	1.8	45	12	10	9	10	15
Other Bus	7.9	198	54	46	38	45	66
Commuter Boat	0.3	8	2	2	1	2	3
Total	100.0	2,504	687	583	478	565	836

Car Capacity: Red Line - 180; Green Line - 165; Blue Line - 110; Orange Line -155

Line west, comprised of the B, C, D, and E Lines. For each line, the number of car/bus loads represented by these passenger totals can be calculated by dividing the added passengers by the car capacity. Summarized, the background growth would increase peak transit demand by up to two carloads per direction per line. When the volumes are further allocated to individual branch lines, of course, the numbers would decrease.

° The public transportation trips for the five build alternatives were then distributed to the transit and bus lines in the same way, as also shown in Table IV A-26. As shown, total AM peak hour trips ranged from 508 for the 250 ft. Tower to 896 for the Developer's Proposal. Total PM peak hour trips ranged from 478 for the 250 ft. Tower to 836 for the Developer's Proposal. Summarized, the build options add up to one carload of passengers in the peak hours to the demands of the No Build alternative, increasing the total added demand to 2-3 additional carloads per peak hour per line. In the highest impact case - the Developer's Proposal - total 1993 AM peak hour passenger volumes rise by 3,106 (5.4 percent) and total 1993 PM peak hour passenger volumes rise by 3,340 (5.0 percent).

Given the many branch lines involved, the many choices of transit stations available downtown, the fact that these trips will be dispersed throughout the peak hour, the flexibility of scheduling and train length available to the system today, and equipment additions already planned, the conclusion is that the impact of any of the options can be reasonably handled by the MBTA.

New Essex Street MBTA Transit Line

An additional long-term transit planning issue which must be addressed in planning the Kingston-Bedford-Essex Street development is the compatibility of the development's underground parking structure with a proposed transit tunnel under Essex Street. The MBTA is exploring various options for an underground people mover -- light rail or bus line -- along Essex Street, extending from the Boylston Green Line station to the Fort Point Channel development area of South Boston.

As outlined by the MBTA, the tunnel would occupy 50 feet of Essex Street, as shown in Figure II-3. The top of the tunnel would be about 50 feet to 55 feet in depth. Preliminary MBTA and development plans showed a close proximity between the northern tunnel tube and a fifth underground parking level (as proposed in the Developer's Proposal). (For all the other alternatives, which would include a six- or seven-level underground garage, the proposed MBTA tunnel alignment would intrude within the garage space.) By agreement with the MBTA, this conflict is being presented in the DEIR with this intent that problems be resolved in the design stages. Correspondence with the MBTA on the matter is contained in Appendix B-6.

Pedestrian Impacts

The main issues involved in assessing the impacts of the project on pedestrian flows are related to the building's entry points and site plan. The key factor is the extent to which the project's entrances and ground level flow patterns reinforce desired pedestrian pathways. In the case of this project, the key pedestrian movements to be accommodated are the following:

- peak hour commuter movements to and from the site and nearby transit stations -- primarily South Station, Washington Station, and Chinatown Station;
- midday, Saturday, and, to some extent, evening movements to and from the site and Downtown Crossing; and
- daily and weekend movements through and around the site to and from Chinatown and Downtown Crossing.

Pedestrian volumes for each of five proposed building entrances were estimated as described above. Total daily, Saturday, and peak hour pedestrian volumes using each entrance for each of the build alternatives are shown in Table IV A-27. As shown, the 400 ft. Tower alternative generates the highest daily volumes of pedestrians, with a maximum of 5,644 per day projected to use the Kingston-Bedford entrance. For each alternative, Saturday daily volumes are one-half or less of the weekday volumes due to the high proportion of office use. The maximum weekday peak hour volume is about 625 persons at the Kingston-Bedford entrance, under the 400 ft. Tower alternative. Because the pedestrians have several choices at this point as to direction and because this intersection will be controlled by a traffic signal, this volume can be readily accommodated at the street corner and crosswalks. The increased pedestrian volumes for each alternative have been taken into account in the calculations for the intersection traffic capacity analysis.

TABLE IV A-27

Pedestrian Distribution Analysis for Build Alternatives

400 Ft. Tower

Time Period	Pedestrian Trips: To/From Transit	Walk	Total	Entrances: Kingston-Bedford	Lincoln-Essex
Average Daily	6,027	2,792	8,819	5,644	3,175
AM Peak					
IN	759	220	979	627	352
OUT	114	81	195	12	570
PM Peak					
IN	171	112	283	181	102
OUT	687	194	881	564	317
Saturday Total	2,495	1,630	4,125	2,640	1,485
Saturday Peak					
IN	103	80	183	117	66
OUT	96	96	96	61	35

325 Ft. Tower:

Time Period	Pedestrian Trips: To/From Transit	Walk	Total	Entrances: Kingston-Bedford	Lincoln-Essex
Average Daily	5,233	2,469	7,702	4,929	2,773
AM Peak					
IN	631	178	809	518	291
OUT	93	65	158	101	57
PM Peak					
IN	144	94	238	152	86
OUT	582	165	747	478	269
Saturday Total	2,270	1,553	3,823	2,447	1,376
Saturday Peak					
IN	99	79	178	114	64
OUT	92	68	160	102	58

250 Ft. Tower:

Time Period	Pedestrian Trips: To/From Transit	Walk	Total	Entrances: Kingston-Bedford	Lincoln-Essex
Average Daily	4,416	2,135	6,551	4,193	2,358
AM Peak					
IN	507	142	649	415	234
OUT	74	51	125	80	45
PM Peak					
IN	119	79	198	127	71
OUT	477	138	615	394	221
Saturday Total	1,995	1,422	3,417	2,187	1,230
Saturday Peak					
IN	90	75	165	106	59
OUT	86	64	150	96	54

Extended Site:

Time Period	Pedestrian Trips: To/From Transit	Walk	Total	Entrances: Kingston-Bedford	Lincoln Essex	Bedford Street	Kingston-Essex
Average Daily	5,371	2,733	8,104	4,214	2,918	486	486
AM Peak							
IN	615	189	804	418	290	48	48
OUT	96	73	169	88	61	10	10
PM Peak							
IN	151	108	259	135	92	16	16
OUT	564	173	737	383	266	44	44
Saturday Total	2,486	1,795	4,281	2,226	1,541	257	257
Saturday Peak							
IN	107	89	196	102	70	12	12
OUT	97	75	172	89	63	10	10

Developer's Proposal:

Time Period	Pedestrian Trips: To/From Transit	Walk	Total	Entrances: Kingstno-Bedford	Lincoln Arcade	Lincoln-Essex	Kingston-Essex	Bedford Arcade
Average Daily	6,299	2,544	8,843	4,598	2,653	531	531	531
AM Peak								
IN	894	207	1,101	573	330	66	66	66
OUT	112	63	175	91	53	11	11	11
PM Peak								
IN	182	94	276	144	83	17	17	17
OUT	837	214	1,051	547	315	63	63	63
Saturday Total	2,550	1,616	4,166	2,166	1,250	250	250	250
Saturday Peak								
IN	113	80	193	100	58	12	12	12
OUT	106	76	182	95	55	11	11	11

B. AIR QUALITY

Description of the Environment

The air quality of an area can be directly related to the quantity of various pollutants emitted into the local atmosphere. Pollutants are emitted by moving sources, such as automobiles, trucks, buses, and trains, and by stationary sources, such as power plants, industrial exhausts, and heating and mechanical systems of residential and commercial buildings. Since the emission of pollutants degrades the ambient air quality and may cause harmful health effects on human beings and their environment, the U.S. Environmental Protection Agency (EPA) issued air quality standards which were to be attained by December 31, 1987, and maintained thereafter.

Because of a lack of industrial operations in the vicinity of the Kingston-Bedford-Essex Street site, the emission of pollutants by stationary sources is very small. The area's air pollution and resulting degradation in air quality is, therefore, due primarily to motor vehicle sources. Carbon monoxide (CO) concentration is the best single indicator of motor vehicle pollutant emissions.

The National Ambient Air Quality Standards (NAAQS) for carbon monoxide established by the EPA are presented in Table IV B-1. Standards for the Commonwealth of Massachusetts are identical with those of the EPA.

TABLE IV B-1

Massachusetts and National Ambient Air Quality Standards (NAAQS) for Carbon Monoxide (CO)

Averaging Times	Primary Standards	Secondary Standards
8 hours	9 parts per million (ppm) (10 milligrams per cubic meter)	Same as Primary
1 hour	35 parts per million (ppm) (40 milligrams per cubic meter)	Same as Primary

Notes: Standards are not to be exceeded more than once per year.

National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health.

National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effect of a pollutant.

Several studies of air quality based on vehicular emissions previously have been published for the Kingston-Bedford-Essex Street area. These include studies on Lafayette Place (1978), the Central Artery-Third Harbor Tunnel project (1983), and 125 Summer Street (1986). The State Implementation Plan recognizes the Essex Street area as one of high carbon monoxide (CO) concentration. In measurements taken during 1984, at the State monitoring site at Washington and Essex Streets, CO was found to twice exceed the eight-hour level allowed by the National Ambient Air Quality Standards. However, no exceedances were recorded in 1985, showing an improvement in air quality over this period (Air Quality Data Reports for 1984/1985 and 1985/1986).

Air Quality Analysis Methodology

A microscale analysis was performed to determine the impact of the proposed project on local air quality. Carbon monoxide, a product of motor vehicle emissions, was used in the microscale analysis as an indicator of roadway air pollution levels. Carbon monoxide is the most abundant and persistent pollutant emitted by motor vehicles. Its nonreactive properties allow pollutant transport and dispersion to be modeled.

The objective of the microscale analysis was to determine whether or not, upon construction of the Kingston-Bedford-Essex Street development, the Massachusetts and National Ambient Air Quality Standards for CO would be maintained. The standards, established by the Federal Clean Air Act, are designed to protect the public health and welfare. To demonstrate compliance, it is necessary to identify those areas of human activity (sensitive receptors) exposed to maximum air pollutant levels from motor vehicle emissions in the project area. Using air quality modeling techniques, CO levels were estimated at these sensitive receptors for all project alternatives for the present and future years. Comparison of projected pollutant levels to the NAAQS permits the evaluation of whether or not motor vehicle emissions would pose a threat to the public health or welfare.

Any microscale analysis requires an estimate of background air quality levels. Background levels of CO for l988, in downtown Boston, have been determined by the Massachusetts Department of Environmental Quality Engineering (DEQE) to be 5.0 ppm (one-hour average) and 3.0 ppm (eight-hour average). These values are consistent with DEQE's CO background policy for high-density urban areas.

The air quality microscale analysis utilized peak one-hour traffic volumes for the design day to calculate maximum CO concentrations at the receptor locations. Eighteen receptor locations were selected for the twelve street intersections listed in Table IV B-2 (see also Figures IV B-1 thru IV B-10 for these locations). These were selected in consultation with the DEQE, Division of Air Quality Control, and the BRA. The receptor location selection was based on locales where people tend to congregate, such as bus stops, entrances to stores, and street corners.

TABLE IV B-2

Intersections for Receptor Locations

Receptor No.	Intersection
1	Essex-Washington (DEQE monitor location)
2	Essex-Edinboro
3,4	Essex-Kingston
5	Essex-Columbia
6	Essex-Surface Artery
7,8	Lincoln-Surface Artery
9,10	Bedford-Kingston
11	Bedford-Columbia
12	Otis-Kingston-Summer
13,14,15,16	Bedford-Summer-Lincoln
17	High-Summer
18	Essex-Chauncy-Harrison Ext.

The technical approach used to predict ambient air quality examined the data for maximum one-hour and eight-hour CO concentrations at the eighteen sensitive receptors near the twelve key intersections in the project area. Table IV B-3 lists the three cases used for air quality predictions.

TABLE B-3

Cases Used in Air Quality Predictions

Case No.	Year	Project Alternative
1	1988	Existing
2	1993	No Build (Alt. 1)
3	1993	Alternative 2

The CO background levels to be calculated for 1993 were obtained from 1988 values of 5.0 ppm (one-hour) and 3.0 ppm (eight-hour) by scaling down for the reduction in motor vehicle emission rates, and scaling up for the overall growth in project area traffic, resulting in the 1993 values remaining approximately the same as those for 1988. Peak-hour traffic volumes in the project area were estimated to increase by twenty percent during the period from 1988 to 1993 without development on the project site. The additional traffic generated by the project in 1993 was modeled explicitly into the analysis. Motor vehicle emissions and traffic flow data were utilized to develop models from the EPA MOBILE 3 and CALINE 3 computer programs for calculation of the CO emission data. The analytical data are shown in Table IV B-4. Additional data pertaining to traffic flow include the hot and cold start percentages as shown in Table IV B-5.

Specific data regarding emissions generated for all receptors at the various wind angles, for the existing, No Build, and Alternative 2 (the build alternative generating the greater volume of traffic) scenarios, is provided in Appendix C. (A complete set of computer printouts of the CALINE 3 analysis is available for review at the Boston Redevelopment Authority.)

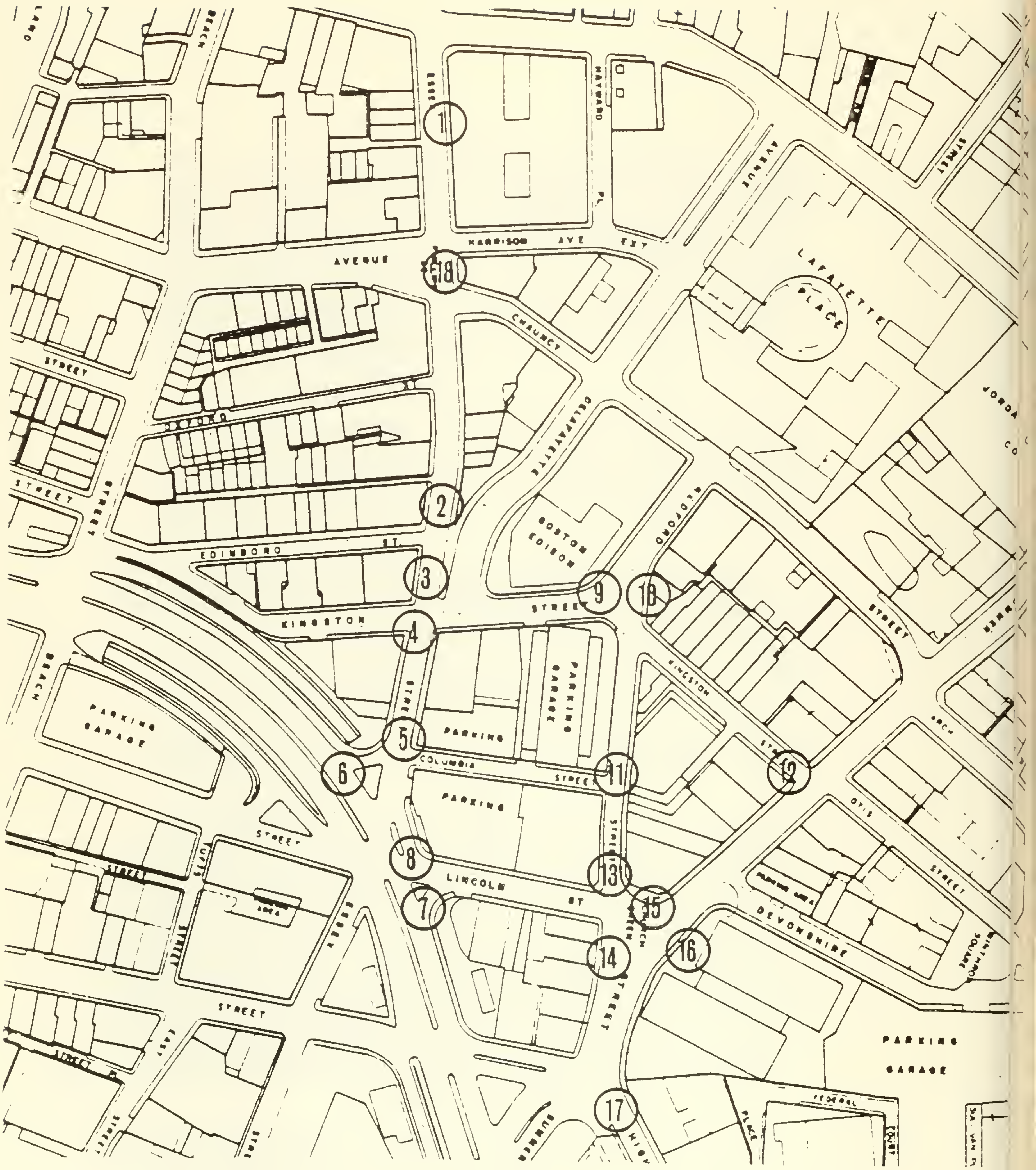


Figure IV B-1:
Receptor Locations No. 1 Through No. 18

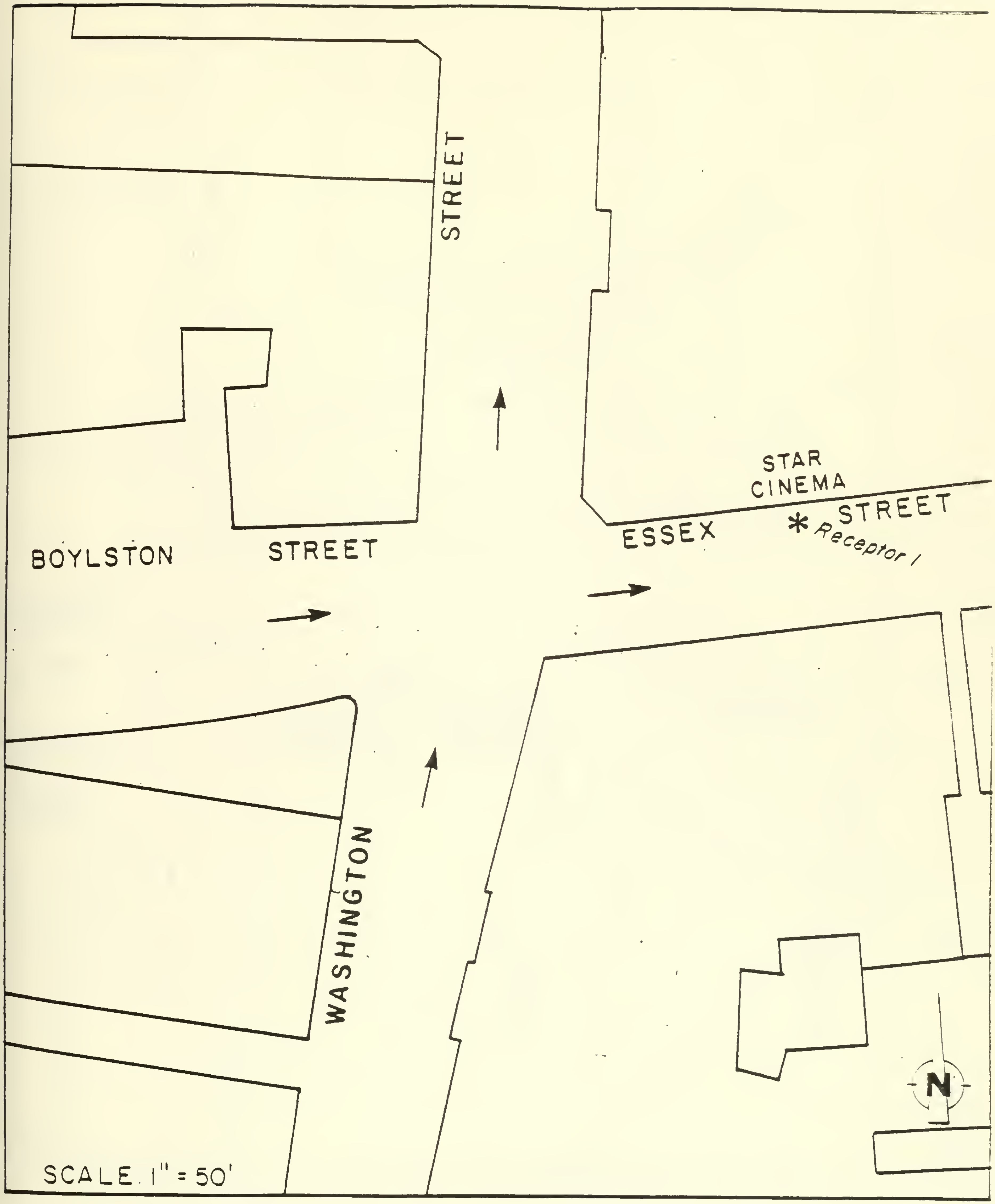


Figure IV B-2:
Receptor 1

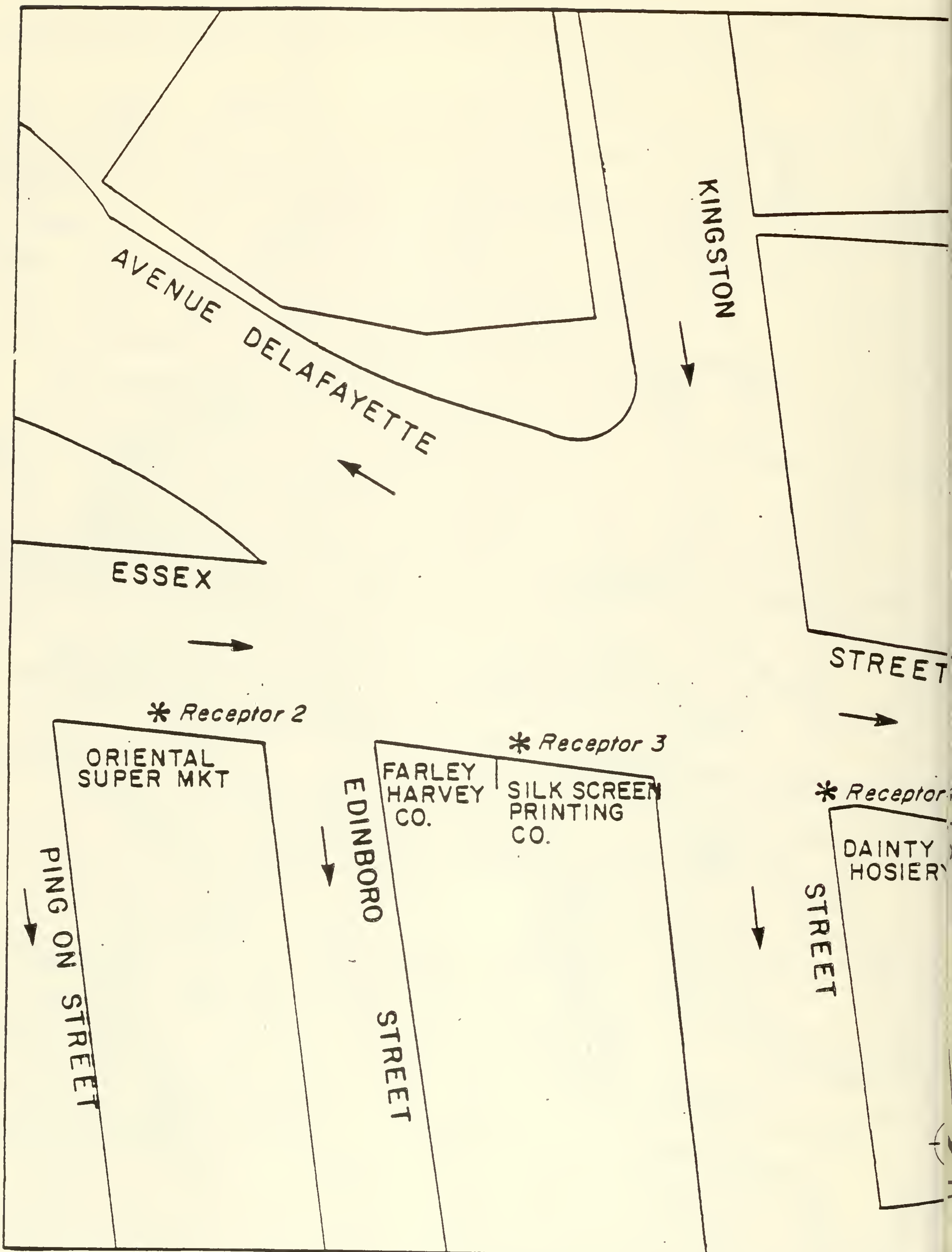


Figure IV B-3:
Receptors 2, 3, & 4

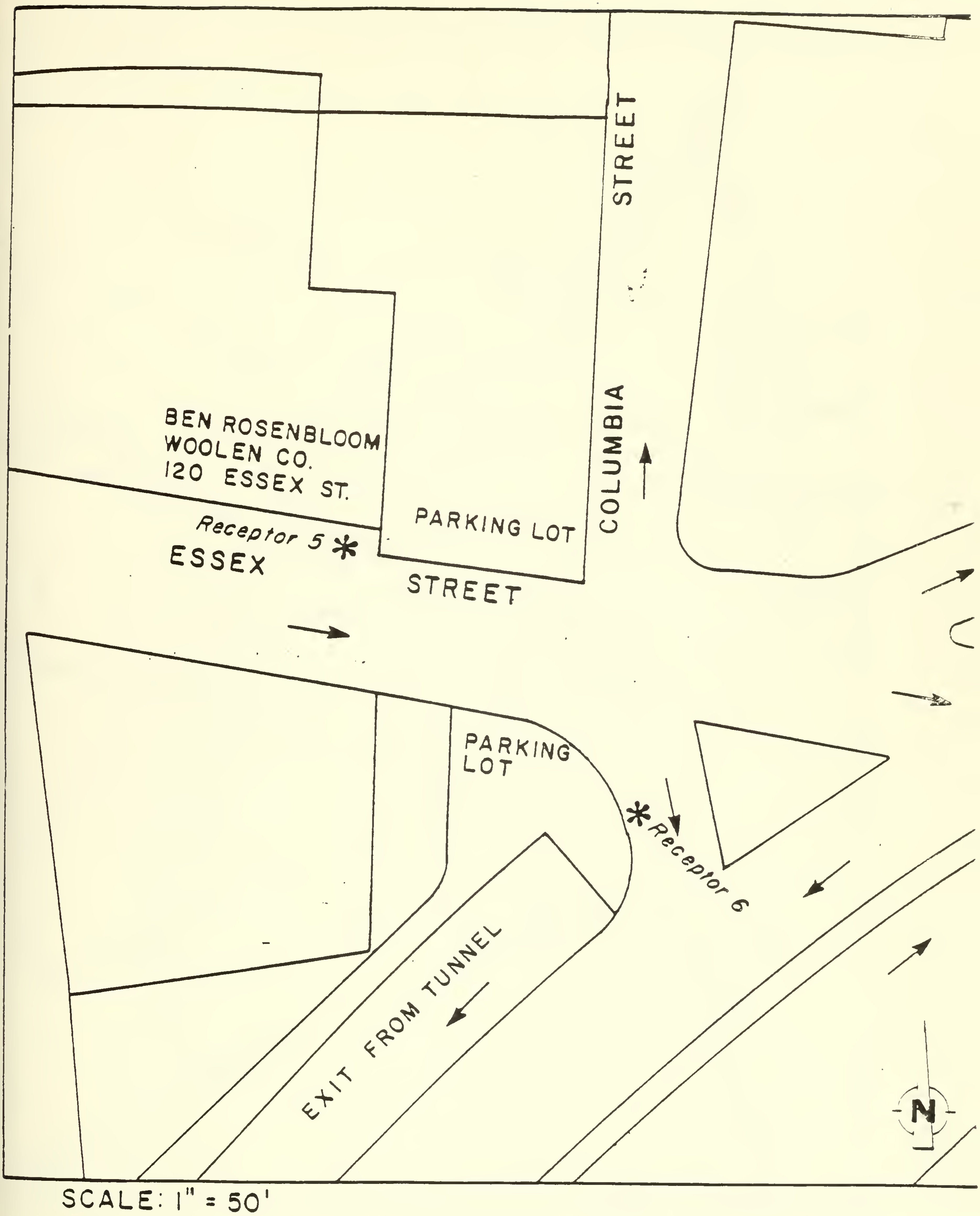


Figure IV B-4:
Receptors 5 & 6

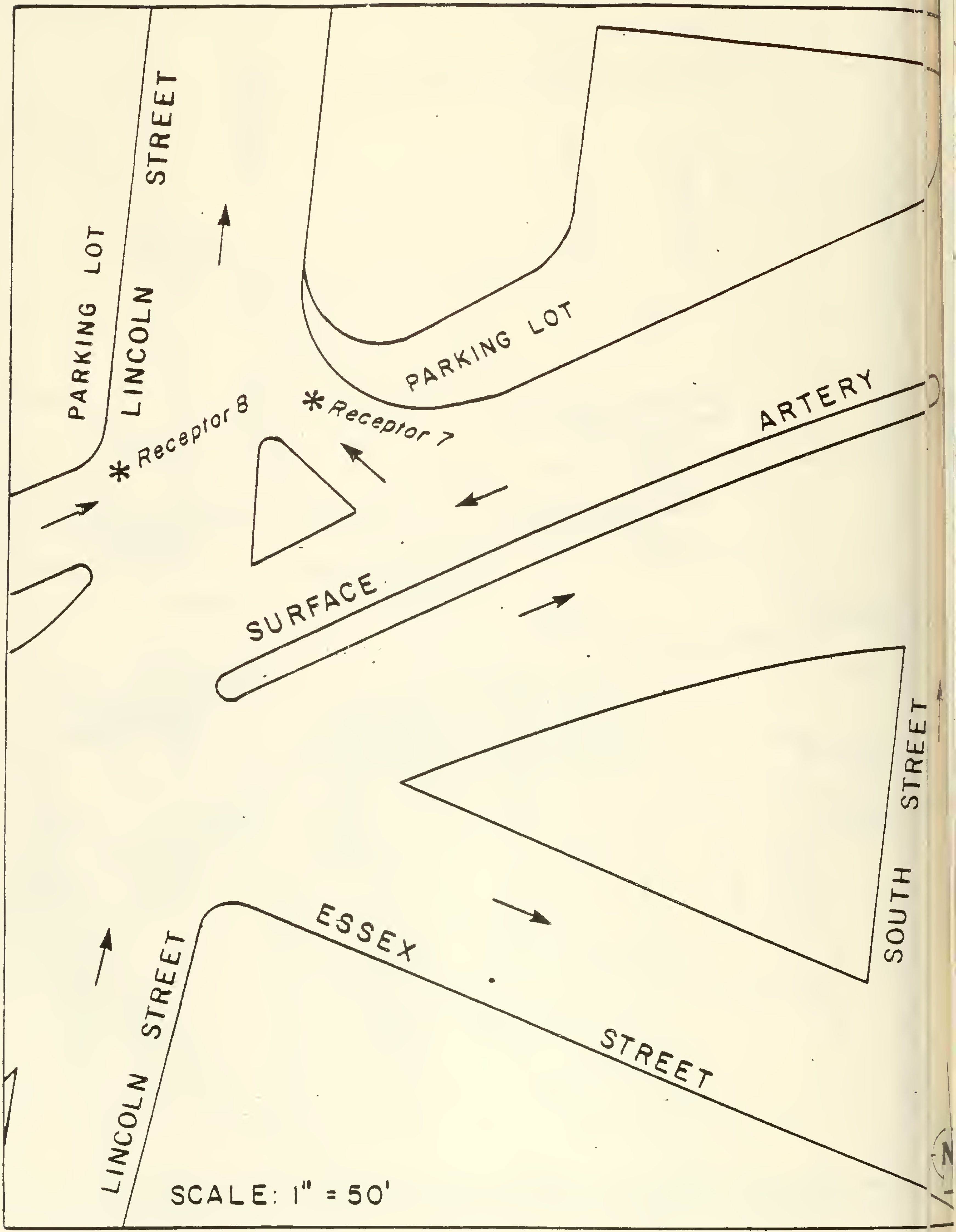


Figure IV B-5:
Receptors 7 & 8

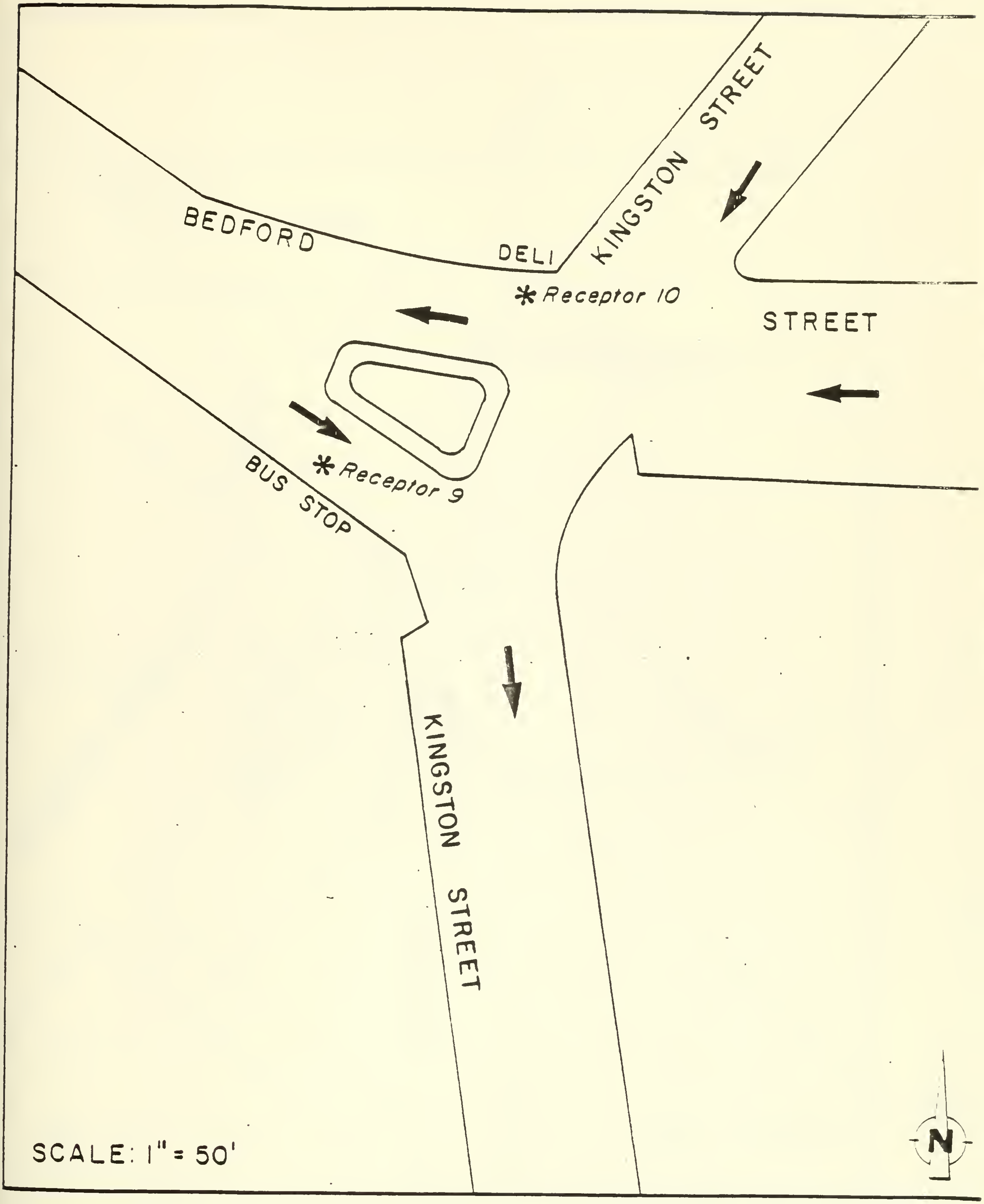


Figure IV B-6:
Receptors 9 & 10

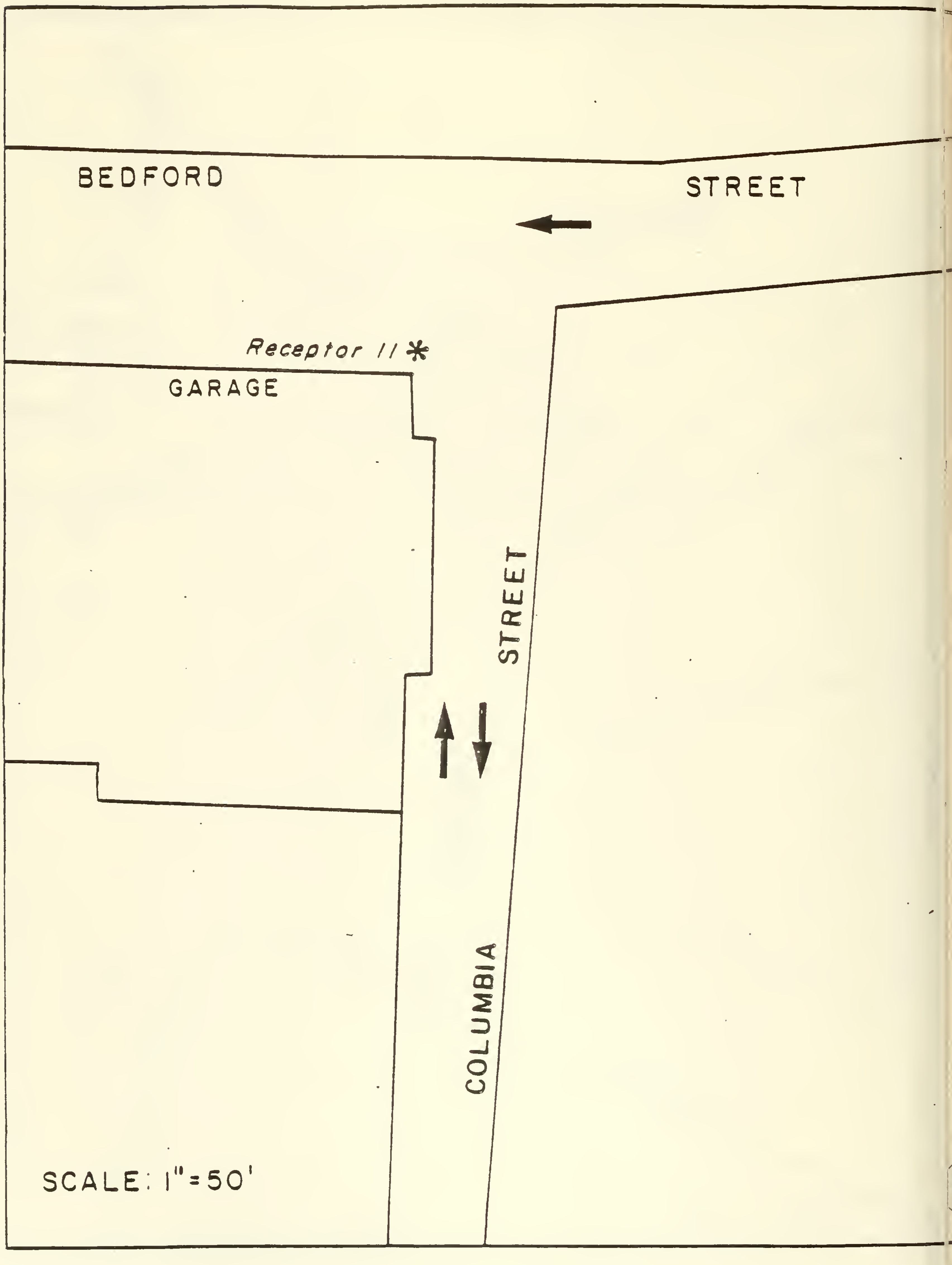


Figure IV B-7:
Receptor 11

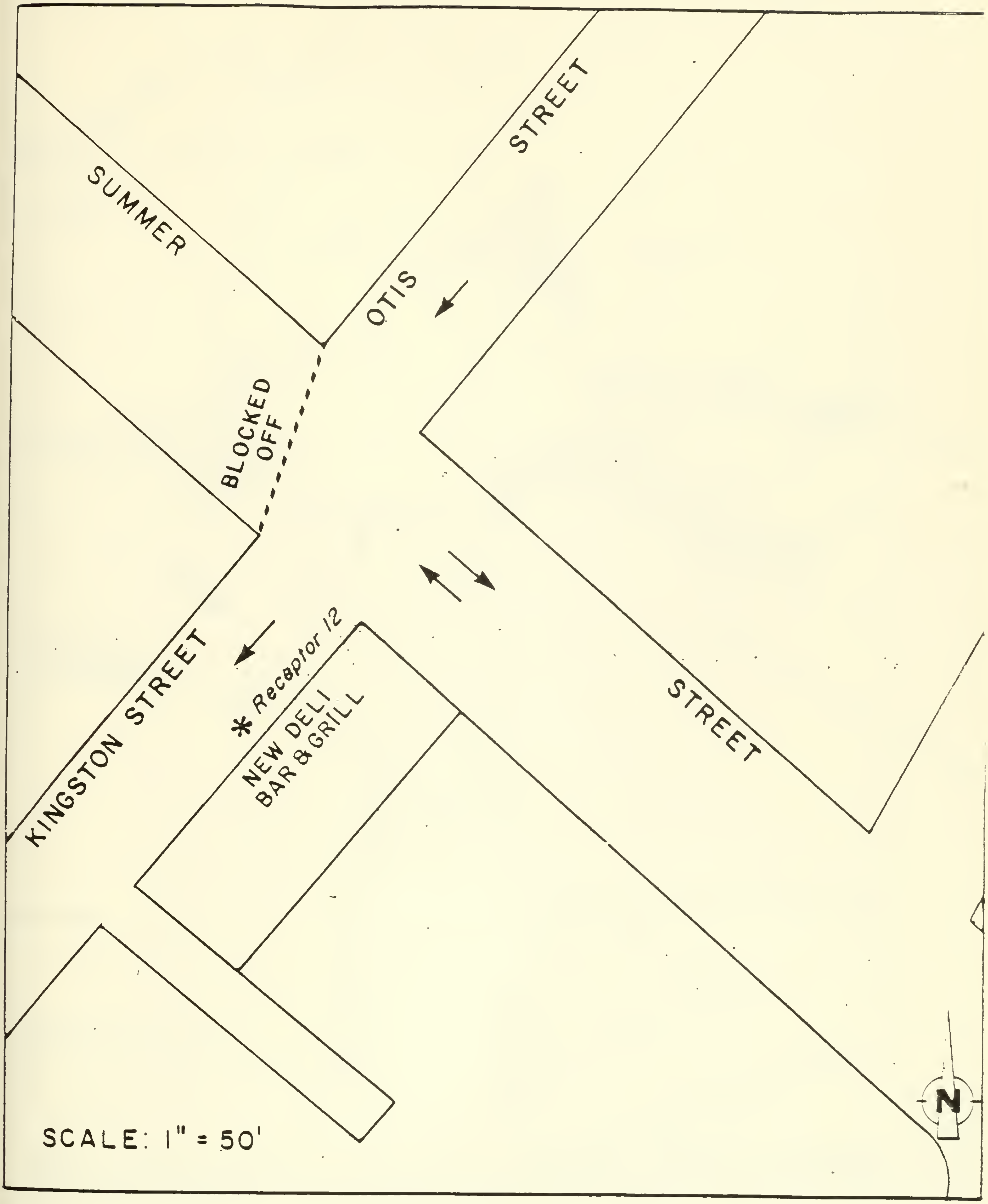


Figure IV B-8:
Receptor 12

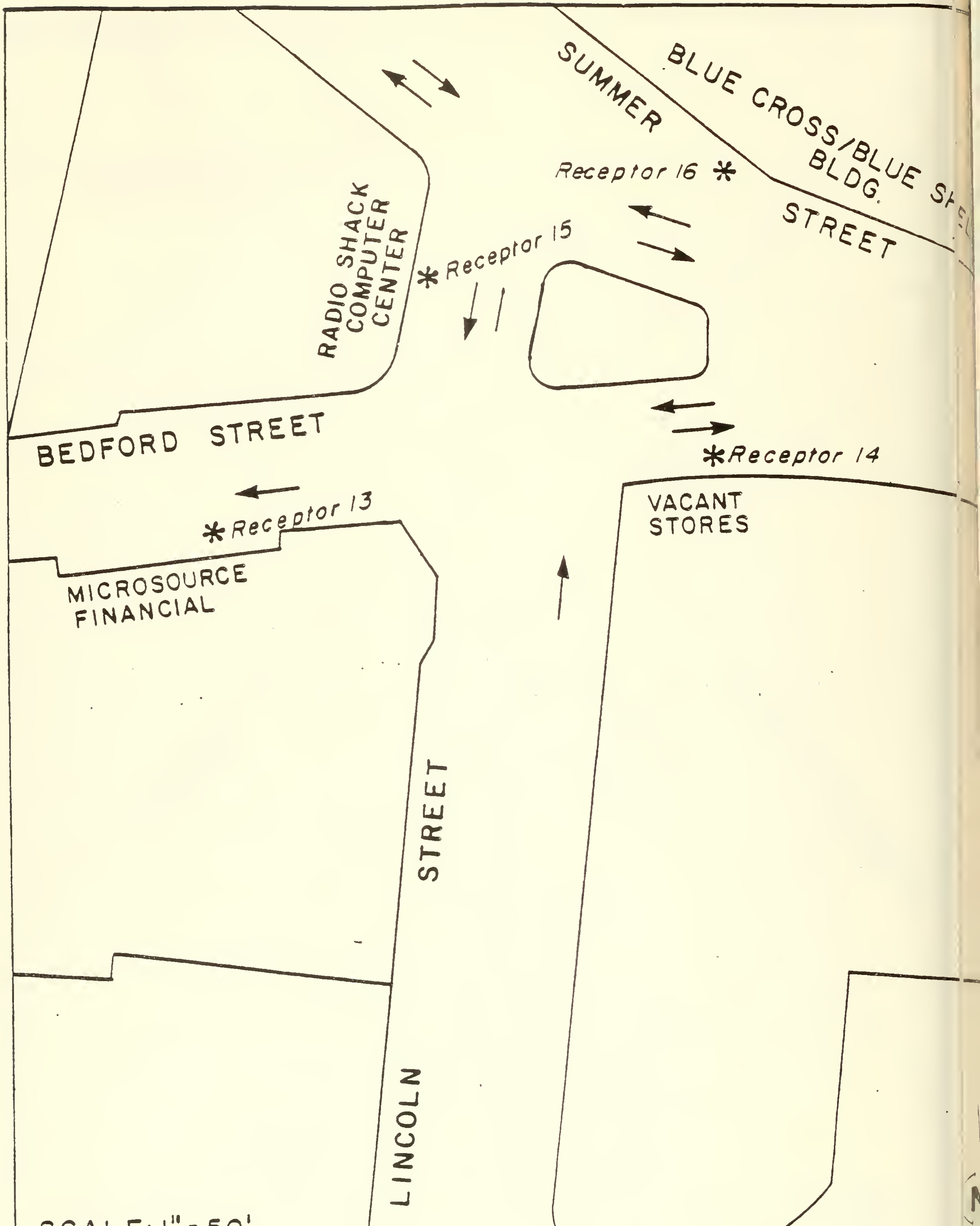


Figure IV B-9:
Receptors 13, 14, 15 and 16

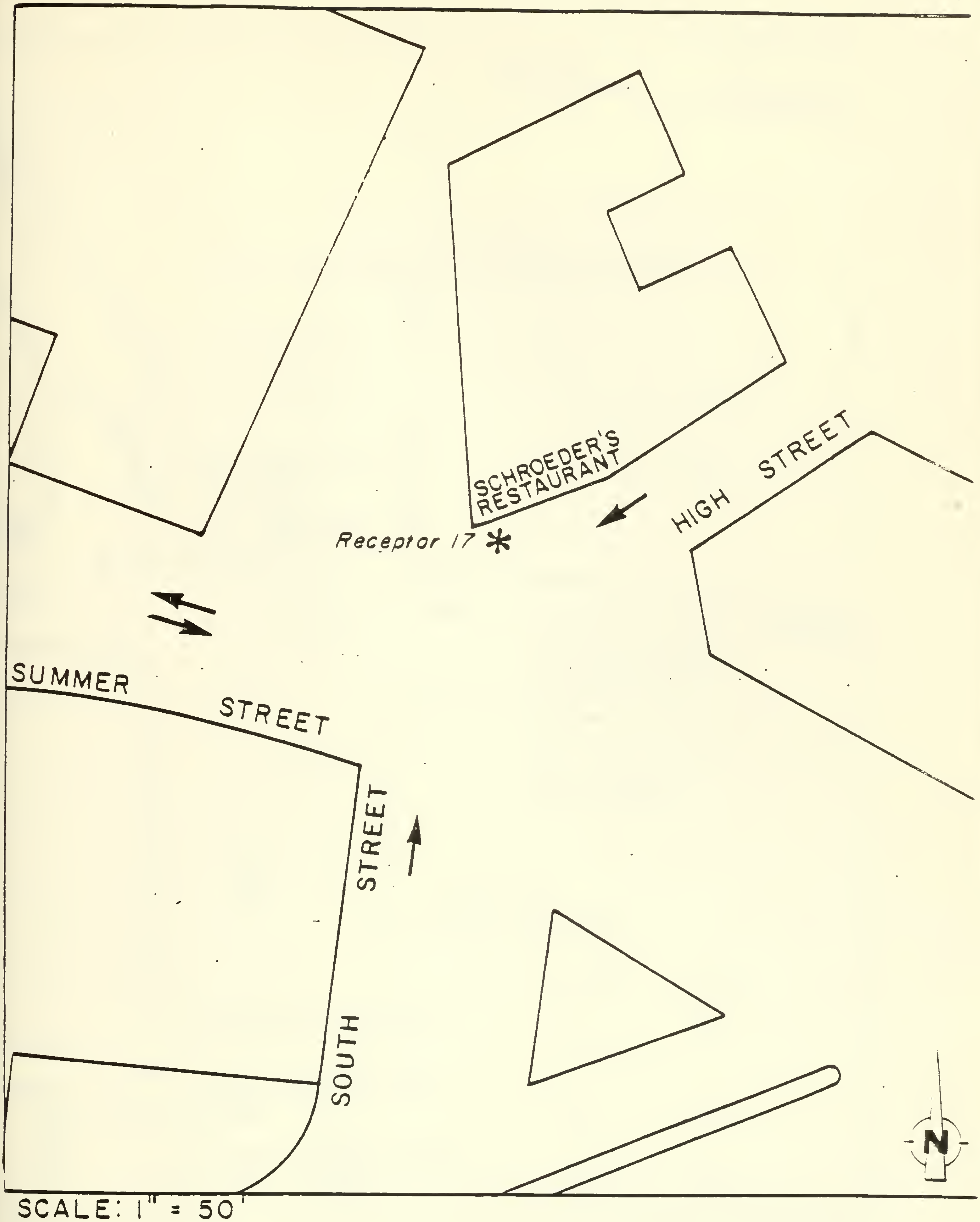


Figure IV B-10:
Receptor 17

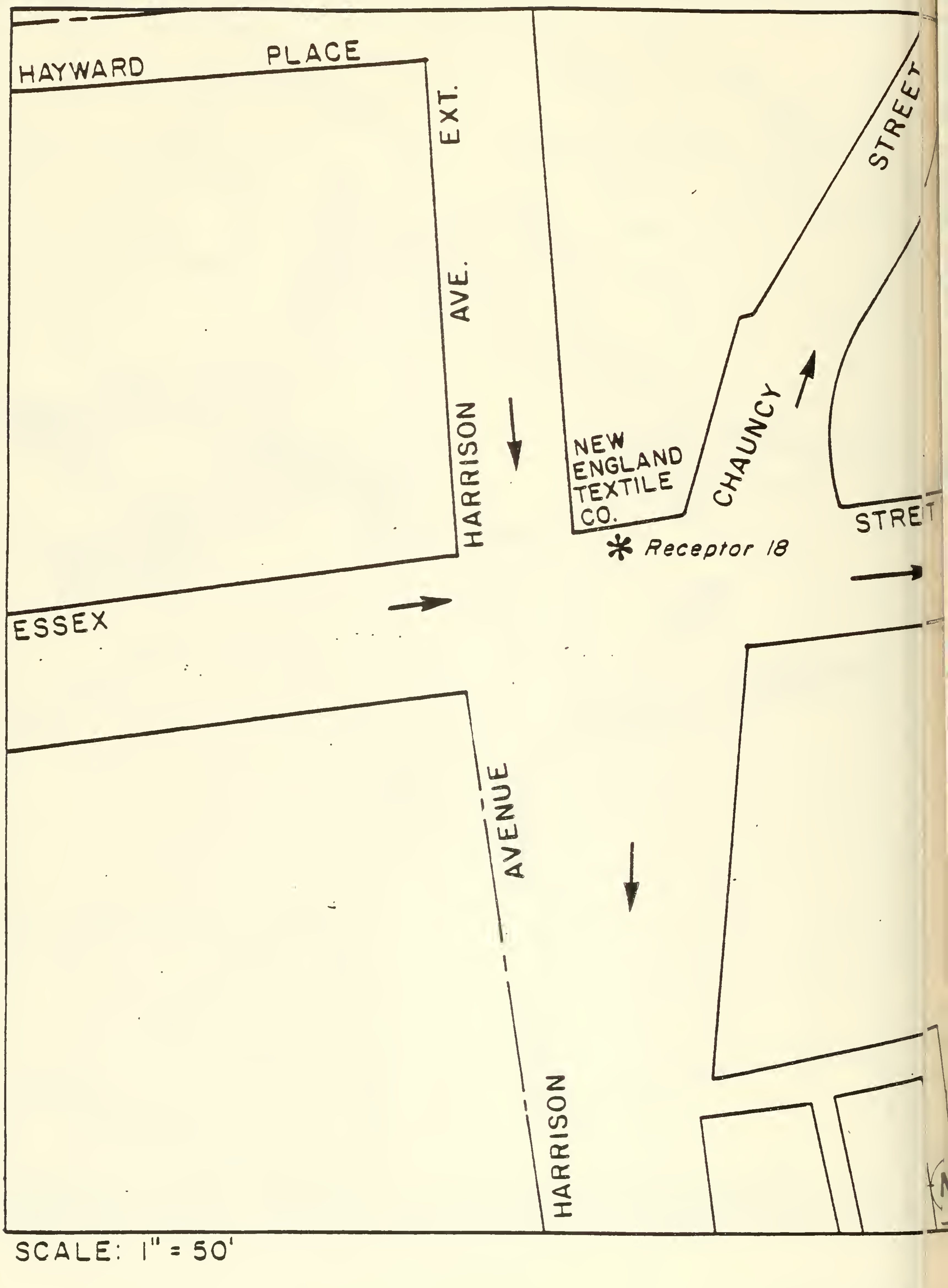


Figure IV B-11:
Receptor 18

TABLE IV B-4

Analysis Inputs for EPA MOBILE 3 & CALINE 3 Computer Program Calculations

Temperature	30°F
Daily Stability	Class D
Wind Speed	1.0 meter/second for both 1-hour and 8-hour
Wind Direction	Worst case as identified by applying 20o increments
Initial Vertical Mixing Height	850 meters
Average Vehicle Length	4.35 meter
Vehicle Mix	I/M credit, 13% stringency, no mechanics training or anti-tampering, starting model year 1972, and 1983 as the beginning of the program
Vehicle Age	Mass. light duty vehicles (July 1, 1983), other categories default

TABLE IV B-5

Hot & Cold Start Percentages

	1-hour	8-hour
% vehicle miles (accumulated in cold start, non-catalyst)	50.0	20.6
% vehicle miles (accumulated in hot start, non catalyst and catalyst)	10.0	27.0
% vehicle miles (accumulated in cold start, by catalyst)	50.0	20.3

Comparisons and Probable Impacts of the Alternatives

The results of the analysis of peak CO concentrations for the 1-hour and 8-hour periods in 1993 show that the values obtained for free flow and queue traffic would not exceed the Massachusetts Standards and NAAQS for any of the alternatives (see Tables IV B-6 through IV B-8).

For existing (1988) conditions, shown in Table IV B-6, the standards for CO emissions also are not exceeded. The one-hour values and the eight-hour values show results that are well below the standards for all receptors and all peak times (AM and PM). The concentrations range from 7.0 ppm to 13.1 ppm for the one-hour period and from 4.2 ppm to 8.2 ppm for the eight-hour period.

TABLE IV B-6

Maximum Predicted Carbon Monoxide Concentrations for Existing (1988) Conditions (Including Background, in Parts Per Million)

Receptor No.	One - Hour AM	One - Hour PM	Eight-Hour
1	8.9	9.0	4.9
2	8.6	9.1	4.9
3	10.0	10.9	5.7
4	11.5	12.6	6.6
5	10.8	11.4	6.2
6	13.1	12.4	6.8
7	12.4	12.7	7.1
8	13.0	12.7	8.2
9	7.3	9.5	4.8
10	8.3	9.7	5.3
11	7.7	7.9	4.7
12	7.0	8.6	4.2
13	7.6	7.8	4.6
14	10.0	9.3	6.0
15	9.5	8.8	5.0
16	12.3	11.3	6.7
17	8.8	8.9	5.2
18	8.7	8.8	5.3

Table IV B-7 presents the year 1993 predicted CO concentrations for the No Build Alternative. For the one-hour values, the concentrations range from 6.7 ppm to 14.8 ppm. The eight-hour values show a range from the low value of 4.3 ppm to the high value of 7.2 ppm. All of these are well within the standards of 35 ppm for the one-hour period and 9 ppm for the eight-hour period.

For Alternative 2, the development alternative which would generate the greatest volume of traffic, all of the predicted values also are well within the standards for both the one-hour and the eight hour periods (Table IV B-8). The one-hour values range from a low of 7.3 ppm to a high of 22.6 ppm. For the eight-hour period, the range was from 4.3 ppm to 7.3 ppm. Since the values for this alternative are all well within the standards, it is reasonable to conclude that the values for Alternatives 3, 4, 5, and 6, which would generate lesser volumes of peak-hour traffic, also would be within the standards.

While the values for the existing (1988) and the No Build Alternative are approximately the same, those for Alternative 2 generally are somewhat higher for the one-hour period. The values for the eight-hour period in Alternative 2 are approximately the same as those for the existing and No-Build conditions.

In order to test the air quality impacts of the implementation of a two-way Essex Street, the AM peak hour was modeled at the 18 receptor locations. In general, there would be a decrease in traffic at most intersections during the AM peak hour (when compared to a one-way Essex Street), with the notable exception of the Lincoln-Essex-Surface Artery intersection, where traffic would substantially increase. However, with the adoption of recommended changes to the traffic signalization timing at this intersection, improvements in traffic flow and turning movements could be effected. The air quality analysis assumed that these signalization changes would be adopted. In the PM peak hour, traffic at most intersections would be fairly comparable to conditions under a one-way Essex Street, with some scattered decreases.

The results of the analysis for the AM peak hour for Alternatives 2 assuming a two-way Essex Street is presented in Table IV B-9. Values range from a low of 7.3 ppm to a high of 12.3 ppm. For most receptors, these values are fairly similar to the AM values obtained for a one-way Essex Street, with the majority of the receptors showing slightly improved air quality. Significant improvements were found at Receptors 3 to 5 at and near the Kingston/Essex/Ave. de Lafayette intersection, even though traffic volumes increased at this location. Again, changes in traffic signalization timing to improve flow and turning movements accounted for this improvement.

Based on the above analysis of AM peak hour impacts, it was concluded that future (1993) air quality levels would be maintained or slightly improved over a one-way Essex Street if the two-way Essex Street proposal were implemented.

Mitigation Measures

The increase in CO emissions resulting from the proposed development is minimal and is not predicted to exceed the NAAQS for either the one-hour or the eight-hour CO concentrations at the various sensitive receptor locations for any of the alternatives examined. Any increase in emissions in this area would be mitigated on a general basis as a result of improvements in motor vehicle emissions required by the Federal Motor Vehicle Control Program. On a local level, the improvements in the Central Artery to allow for greater efficiency in traffic flow, the construction of the Third Harbor Tunnel to provide for the diversion of some traffic flow, the widening of Essex Street, and improvements in traffic flow in and around the project site would contribute to the minimization of CO emissions. Thus, the CO emissions in this area are expected to continue to remain within acceptable standards for the foreseeable future.

TABLE IV B-7

Maximum Predicted Carbon Monoxide Concentrations for No-Build Alternative (1993) (Including Background, in Parts Per Million)

Receptor No.	One - Hour AM	One - Hour PM	Eight-Hour
1	8.7	10.0	5.4
2	8.2	10.0	5.4
3	9.6	12.4	5.6
4	11.2	14.8	7.2
5	9.3	13.8	6.4
6	10.6	11.4	6.6
7	11.8	10.9	6.4
8	10.8	10.7	6.2
9	7.1	8.6	4.9
10	8.5	9.0	4.9
11	6.7	7.5	4.3
12	7.2	8.6	4.4
13	7.4	7.3	4.3
14	10.0	8.5	4.8
15	9.7	8.9	4.8
16	11.1	10.0	5.7
17	8.4	8.5	4.7
18	7.8	9.1	5.0

TABLE IV B-8

Maximum Predicted Carbon Monoxide Concentrations for Alternative 2 (1993) (Including Background, in Parts Per Million)

Receptor No.	One - Hour AM	One - Hour PM	Eight-Hour
1	9.9	10.2	5.4
2	15.2	10.2	5.3
3	20.2	12.6	5.6
4	22.6	13.2	7.3
5	18.0	15.1	5.9
6	12.2	11.5	6.6
7	12.0	11.0	6.4
8	12.0	10.8	6.4
9	7.4	8.7	5.0
10	8.4	9.4	5.1
11	7.3	7.4	4.3
12	7.6	9.0	4.6
13	7.4	7.3	4.3
14	10.7	8.6	4.9
15	9.8	8.9	4.9
16	11.3	10.1	5.9
17	9.0	8.7	4.8
18	9.9	9.3	5.0

TABLE IV B-9

Maximum Predicted Carbon Monoxide Concentrations for Alternative 2 (1993), 2-Way Essex Street (Including Background, in Parts Per Million)

Receptor No.	One-Hour AM
1	8.7
2	9.0
3	10.7
4	12.3
5	11.6
6	10.4
7	12.1
8	11.7
9	8.5
10	8.0
11	7.3
12	7.6
13	7.4
14	9.0
15	8.5
16	10.0
17	8.6
18	8.1

C. NOISE

Description of the Environment

The noise environment of the project area is dominated by motor vehicle traffic on the Surface Artery, the Central Artery, and local streets, by aircraft from Logan Airport, by building mechanical systems, and by construction equipment. These sources are typical of an urban environment and create relatively high noise levels. Noise sensitive land uses in the vicinity of the project site include residential buildings south of Essex Street.

Noise monitoring for existing conditions in the vicinity of the site has been conducted for other projects. These include the Draft Dewey Square Comprehensive Transportation Systems Management Program (BRA, 1984) and the Third Harbor Tunnel, I-90/Central Artery, I-93 Final Environmental Impact Statement (Federal Highway Administration, 1986). The monitored noise results are expressed as decibels through an A-weighting filter (dBA) which corresponds well with an individual's perception of noise. Noise is comprised of a number of sound sources of different durations and intensities. These noise fluctuations can be condensed into a single number called the Equivalent Noise Level (Leq) for one hour. At or adjacent to the Surface Artery noise levels range from 74 to 78 dBA (Leq), which is a relatively noisy environment.

Traffic-generated noise is primarily derived from tire friction where higher travel speeds generate higher noise levels. Therefore, the area that is likely to experience the most adverse noise conditions would be one in which the traffic flows relatively unimpeded. Essex Street between Harrison Avenue and the Surface Artery is one area that has existing one-way traffic flow with few turning conflicts and adjacent noise sensitive residential uses and, therefore, is highly susceptible to high noise levels.

The Federal Highway Administration (FHWA) exterior noise criteria for residential land use is 67 dBA (Leq). The FHWA traffic noise prediction model (FHWA RO-77-108, 1978) was used to estimate the existing (1988) noise levels generated by peak traffic along Essex Street between Harrison Avenue and the Surface Artery. The results indicate that residences along Essex Street currently are exposed to noise levels of 62 dBA (Leq) from vehicles traveling along Essex Street. These are acceptable noise levels for residential use, under the FHWA criteria. Appendix D contains the noise analysis worksheets.

Comparison and Probable Impacts of the Alternatives

Estimates of the potential traffic-related noise impacts along Essex Street have been assessed for the 1993 future No Build Alternative as a basis for comparison with the build alternatives. Appendix D contains the noise analysis worksheets which support the discussion below.

Traffic along Essex Street is expected to increase by 64 percent by 1993 and would result in a noise level of 64 dBA (Leq). This 2 dBA increase would be imperceptible compared to the existing 1988 noise environment, which is estimated to be 62 dBA (Leq). An estimate of the potential traffic-related noise impacts related to the reconstruction of Essex Street to two-way also was analyzed. Traffic would increase by another 47% percent, resulting in an additional 1 decibel increase in noise. This Increase translates to 3 decibels over 1988 existing conditions, which also is an imperceptible impact (increases less than 5 dBA are considered to be barely perceptible to the human ear).

The same methodology of estimating traffic related noise impacts was applied to Alternatives 2 and 6, the alternatives with the largest total building program and, thus, expected to produce the largest increases in traffic generation. These alternatives are not expected to result in any noise increase over the No Build Alternative. The other alternatives (Alternatives 3, 4, and 5), which would produce less traffic generation, likewise would yield no change over the No Build Alternative.

Mitigation Measures

Due to projected insignificant increases in noise levels, no specific mitigation measures for traffic generated by the alternatives are required. However, careful site design (setbacks and architectural treatments) and operational policies which would reduce peak hour traffic volumes (e.g.van pools, car pools, transit ridership, etc.) would contribute to minimizing the overall potential adverse effects of noise on sensitive uses from the Kingston-Bedford-Essex Street project.

D. UTILITIES

Description of the Environment

Water

Water for the City of Boston is supplied by the Massachusetts Water Resources Authority (MWRA) from the largest man-made reservoir system in the world. This source of water is the Quabbin Reservoir and Wachusetts Reservoir. Current total usage consistently exceeds the safe daily yield of 300 million gallons per day (mgd). Despite continued conservation efforts, demand is expected to increase to 420 mgd by the year 2020. The water supplied by the MWRA is of very high quality. However, degradation of the water quality in the supply system does occur and generally is caused by lead from lead solder used in building plumbing. Current plumbing codes require the use of lead-free solder for new work.

The MWRA jurisdiction terminates at the various metering locations serving the City of Boston. The Boston Water and Sewer Commission (BWSC) has jurisdiction immediately downstream of these meters.

Water for consumption and fire service is supplied by the BWSC through low service lines, high service lines, and a separate high pressure fire service system. Water main sizes in the streets contiguous to the project site are shown in Table IV D-1. There is also a 36-inch water supply conduit in Kingston Street which is not used for connections.

TABLE IV D-1

Water Main Size (Inches)

	Low Service	High Service	High Pressure Fire Service
Kingston Street	6	12	12
Columbia Street	6	-	-
Lincoln Street	12	8	20
Bedford Street	16	12	16
Essex Street	8	10	16
Central Artery	12	12	16

Fire flow test data are limited in this area. The nearest location is at Waverly Place and South Street where the 8-inch high service was last tested. The test results are as follows:

Date Tested	6-86
Static Pressure	95 PSI
Residual Pressure	90 PSI
Flow	3,740 GPM
Flow at 20 PSI	16,100 GPM

Electricity

Electric power supply lines serve all properties in the vicinity of the project site. Current estimated usage by the project site is less than one megawatt per year. Substantial development in the vicinity has prompted the planning of additional primary power conduits by the Boston Edison Company.

All power to the site is provided under the jurisdiction of the Boston Edison Company through the Kingston Street bulk substation, which is fed by two 115 kV transmission systems. This substation supplies the 13.8 kV and the 4 kV distribution networks. The Kingston-Bedford Street garage is currently supplied by the 13.8 kV network. The power is transformed on site for lighting, elevator operation, and other needs. Based on an average of 5 watts per square foot and a building area of 150,000 square feet, a peak demand of 750 kW may be projected. The Lincoln-Essex Street parking lot and the adjacent buildings are supplied by the 3-phase 120V/208V secondary distribution system.

Locally, the power is generated from oil and gas by the Mystic generating station in Everett and the New Boston generating station in South Boston (the closest to the site). These stations supply the 115 kV system directly. Power also is generated by the Pilgrim Nuclear power plant in Plymouth, which feeds the local system via a 345 kV transmission line which is transformed to 115 kV at stations in Holbrook, Walpole, and Medway. Currently, however, the Pilgram station is not in operation.

The connected capacity of the Mystic, New Boston, and Pilgrim power plants is 2,823 megawatts. The peak demand load, which occurred on August 11, 1988, was 2,626 megawatts.

Additional power may be drawn from the northeast power grid. Grid power is produced by oil, gas, coal, nuclear, and hydroelectric stations.

In order to provide much-needed additional electrical power transmission capability into downtown Boston, Boston Edison has constructed a new substation adjacent to the existing Kingston Street substation and is laying a 345kV underground transmission line to this substation from the Mystic generating station in Everett. This project, known as the North/Downtown Transmission Reinforcement project, is scheduled to be completed in June, 1989.

Gas

The Boston Gas Company provides gas service to the project area. Six inch gas mains in Kingston, Bedford, Columbia, and Lincoln Streets are contiguous to the development site as is a 10-inch main in Essex Street. The original installation of these mains dates back to 1890 through 1904. A newer 12-inch main in Essex Street west of Kingston Street was installed in 1954. There is no current demand at either the Kingston-Bedford Street site or the Essex Street site.

Steam

Steam is provided to the project area via an underground distribution system by the Boston Thermal Corporation, which recently acquired the steam generating facilities of the Boston Edison Company.

Current steam generating capacity is provided by three steam generating plants using oil and gas as fuels. Gas is used during months when gas supply exceeds demand. The steam plants are located at Kneeland Street, Minot Street, and Scotia Street and have a connected capacity of 1.9 million pounds per hour. A peak demand of approximately 1.2 million pounds per hour occurs during the winter. Facilities using steam as a heat source may also utilize it for the operation of air conditioning systems using chillers.

Sewer System

The public sewer system serving the project site is operated by the Boston Water and Sewer Commission (BWSC). This system consists mainly of combined storm and sanitary drainage. Stormwater and wastewater from existing buildings in the site area are collected by combined sewers and conveyed to the East Side Interceptor, then to the Massachusetts Water Resources Authority (MWRA) treatment facility at Deer Island, where the wastewater receives primary treatment and chlorination before being discharged into Boston Harbor. At the present time, the MWRA is beginning a major upgrading of the Deer Island facility, which will increase its capacity to 1,273 mgd by 1999 and provide secondary treatment to the wastewater.

Site Collection System

The two sites at Kingston-Bedford Streets and Lincoln-Essex Streets are served by a combined sewer system dating to the late Nineteenth Century. The sewers in Bedford, Kingston, Columbia, Lincoln and Essex Streets, and the Surface Artery generally are built of brick ranging from 12 inches to 48 inches in diameter with circular or oval shapes. The estimated capacity of the sewer lines, based on size, slope, and pipe construction, is as follows:

Bedford Street	12 inch	2.5 cfs	1.6 mgd
Kingston Street	24x36 inch	28.0 cfs	8.0 mgd
Essex Street	36x54 inch	60.0 cfs	9.0 mgd
Columbia Street	15 inch	9.5 cfs	6.1 mgd
Lincoln Street	24x27 inch	23.0 cfs	15.0 mgd

Structural deficiencies, such as missing mortar, loose or missing brickwork, and other signs of deterioration, may be present in the site sewers. Loss of supporting material around the sewer can result in voids and ultimate collapse of a sewer. Such voids are commonly associated with points of infiltration and exfiltration.

The site collection system is tributary to the Purchase Street 72-inch trunk line, which has a capacity of 85 cfs or 55 mgd, and drains a substantial portion of the sewage from the financial district as well. This trunk discharges into the East Side Interceptor, which recently has been rebuilt and enlarged by the Boston Water and Sewer Commission to eliminate previous system deficiencies and frequent combined sewer overflows. With the operation of this new Interceptor, the BWSC expects to eliminate all dry weather overflows and to decrease the volume and frequency of storm-related (wet weather) overflows. Those overflows which would occur would be discharged into the Fort Point Channel through a combined sewer overflow (CSO) outlet located just south of Northern Avenue (BOS-062).

During intense or prolonged rainfall, combined sewer systems typically reach capacity. To prevent uncontrolled discharges, regulators are provided at strategic locations. These regulators allow supernatant flow containing few solids to flow over a bulkhead and into surface waters via combined sewer overflow outlets. These overflows contribute high levels of bacteria, solids, biochemical oxygen demand, nutrients, and metals to the water. However, following the initial plug of wastewater during the course of a rainfall event, discharges tend to become cleaner. It is, thus, the frequency of the overflow events that represents the greatest impact on water quality in the Boston Harbor and Fort Point Channel and causes violations of the current SC water quality classification.

Current Site Discharge

The project sites are currently l00% impervious. A precipitation intensity of one inch per hour would contribute l.8 cubic feet per second to the local system.

Estimated dry weather discharges from the two sites are minimal and are associated with the restroom facilities at the Kingston-Bedford Street garage (4,500 gallons per day).

Comparison of the Alternatives

Water

Alternatives 2 through 6 for the development of the Kingston-Bedford Streets and Lincoln-Essex Streets sites will require additional water allocation. The current usage is minimal and represents 4.5 percent of the potential demand under the most intensive development scenario. Water usage is estimated to exceed sewage flow by approximately 15 percent. The summary in Table IV D-2 shows the flows for the various alternatives. These water demands are derived from the sewage flow estimates (see Tables IV D-7 to IV D-12) and are consistent with the BWSC estimating methods.

All of the build alternatives would require water at 232 to 311 gallons per minute (peak demand). This greatly exceeds the 8.0 gpm that the sites would continue to require under Alternative 1 (No Build).

TABLE IV D-2

Quantification of Water Usage

Flow	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Avg (gpd)	5,200	115,100	95,850	79,350	100,500	103,100
Avg (gpm)	3.6	80	67	55	70	72
Peak (gpd)	11,500	448,500	393,300	333,500	411,700	402,500
Peak (gpm)	8.0	311	273	232	286	280

Electricity

Each build alternative will place a demand on the available city energy supply. The No Build Alternative would require very little energy. Demand would be equivalent to that required by existing conditions. While each of the build alternatives will require considerable additional energy, building size and use will determine the actual amount of energy needed.

For the purpose of peak energy demand loading estimation, the following loading rates are used (Personal communications, 1986a):

Garage	1 watt per square foot
Hotel	7 watts per square foot
Retail/plaza	8 watts per square foot
Commercial/Office	10 watts per square foot

These figures include heating, cooling, lighting, appliances and equipment. They account for incandescent lighting in residential spaces, retail display lighting, and moderate computer facility usage in the commercial space. Electric demand is tabulated in Table IV D-3 for the five build alternatives. Total demand for the build alternatives ranges from 5.6 to 9.7 megawatts. The No Build Alternative would require 0.75 megawatt.

Gas

Gas usage for the proposed development would be limited to cooking requirements in the restaurants and hotel units (if kitchen facilities are included). There would be no usage under the No Build Alternative.

Restaurant gas usage is dependent on seating capacity, volume of business, type of cooking, and management practices. A high estimate would indicate 4,000 cubic feet per hour (cfh) for 200 seats. Hotel usage is at the rate of 60 cfh for peak requirements per kitchen. Maximum possible demand would be 10,000 cfh under Alternative 2, 7,300 cfh for Alternative 3, 6,200 cfh for Alternative 4, 11,900 cfh under Alternative 5, and 10,000 cfh under Alternative 6. Actual peak demand probably would be lower. Due to the plumbing requirements and higher capital costs, gas service for the hotel units may be prohibitive.

Steam

Accurate estimation of steam requirements for heating and cooling purposes is not feasible at this stage of the proposed development. Based on gross square footage and a rough approximation of 0.1 pound per square foot per hour, demands are calculated in Table IV D-4. Steam demands, thus, would be 58,000 lbs/hr for the smallest build alternative and 100,500 lbs/hr for Alternative 6.

Sewer System

The five build alternatives consist of creating from 580,000 to 1,005,000 square feet of commercial, office, hotel, and retail space. A 600 to 900 car garage is included in each scenario. The estimated average daily sanitary sewerage volume ranges from 69,000 gallons per day (gpd) for Alternative 4 to 100,100 gpd for Alternative 2. Alternatives 3, 5, and 6 would generate estimated average daily flows of approximately 83,000 gpd, 87,000 gpd, and 90,000 gpd respectively. The No

TABLE IV D-3

Peak Electric Power Demand

Description			Alt.1	Alt.2	Alt.3	Alt.4	Alt.5	Alt.6*
Kingston/Bedford								
	Retail	sq ft		14,000	14,000	14,000	22,000	54,000
		kW		112	112	112	176	432
	Plaza	sq ft		3,360	3,360	3,360	28,464	7,300
		kW		27	27	27	227	58
	Office	sq ft		679,500	554,000	429,000	510,000	892,000
		kW		6,795	5,540	4,290	5,100	8,920
	SUB TOTAL							
		kW		6,934	5,679	4,429	5,503	9,410
Lincoln/Essex								
	Retail	sq ft		8,000	12,000	12,000	8,000	
		kW		64	96	96	64	
	Plaza	sq ft		2,240	2,240	2,240		
		kW		18	18	18		
	Hotel							
		sq ft		192,000	138,000	118,000	182,000	
		kW		1,344	966	826	1,274	
	SUB TOTAL							
		kW		1,426	1,080	940	1,338	
Garage								
		sq ft	150,000	260,000	195,000	195,000	260,000	290,000
		kW	750	260	195	195	260	290
TOTAL CONSUMPTION								
		kW	750	8,620	6,954	5,564	7,101	9,700

* The total space and kW usage for both Kingston-Bedford and Lincoln-Essex are combined under Kingston-Bedford for Alternative 6.

TABLE IV D-4

Steam Demand*
(lbs/hr)

Description	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6**
Kingston-Bedford gsf	700,000	575,000	450,000	540,000	1,005,000
0.1 lbs/hr	70,000	57,500	45,000	54,000	100,500
Lincoln-Essex gsf	200,000	150,000	130,000	190,000	
0.1 lbs/hr	20,000	15,000	13,000	19,000	
TOTAL CONSUMPTION					
lbs/hr	90,000	72,500	58,000	73,000	100,500

* Usage is based on 0.1 pounds/square feet/hour. Alt. 1 (No Build) has no steam demand.

** Combined Kingston-Bedford and Lincoln-Essex gsf.

TABLE IV D-5

Sewage Flow Generation Rates*

Boston Water and Sewer Commission Standards:		
Hotel (per bedroom)	110	gallons per day
Office building (per 1,000 sq.ft.)	75	gallons per day
Dry goods retail (per 100 sq.ft.)	5	gallons per day
Restaurant (loung/tavern/food service establishment)		
General (per seat)	35	gallons per day
Kitchen flow (per seat)	15	gallons per day
Garage Site:		
Employee (per employee)	75	gallons per day
Parking space (per space)	5	gallons per day
(Peak flow calculation based on continuous use of two basins and two water closets, i.e. 750 uses per day)		
Space Ratios:		
Restaurant	10	sf per seat
Space Flow Ratios:		
Restaurant (per 100 sq.ft.)	500	gallons per day

* Basic flow rate data for use in projecting flow rates for each alternative.

Build Alternative would not increase the 4,500 gpd current estimate. These values are based on the sewage generation rates shown in Table IV D-5, which are taken from the Boston Water and Sewer Commission standards as well as standard (published) literature.

The estimated average daily flow is not constant throughout a 24 hour period. Maximum and minimum flow periods are associated with the daily routine followed by most users of the sewage collection system. Empirical evidence suggests that the peak flow can be five times that of average daily flows for a population of 1,000 people. As the population served increases, this peaking factor is reduced (see Figure IV D-1). The maximum dry weather flow for each building on the combined sites are identified in Table IV D-6 and Tables IV D-7 thru IV D-12. The totals range from 290,000 gpd for Alternative 4 to 390,000 gpd for Alternative 2. For Alternative 1, a peaking factor was not used. The 10,000 gpd peak flow estimate assumes continuous usage of the limited existing facilities.

Probable Impacts of the Alternatives

Water

The impacts of water requirements must be considered both on a local basis and on a regional basis. Though determination of the specific capacity of the system at the development site requires hydrant tests adjacent to the site, it may be presumed that the 232 to 311 gallons per minute (gpm) required during peak usage periods can be accommodated. It would be necessary to pump the water to provide services in the upper floors in each building. The pressure drop due to a draw of 232 to 311 gpm on the water main should be nominal (1 to 2 psi).

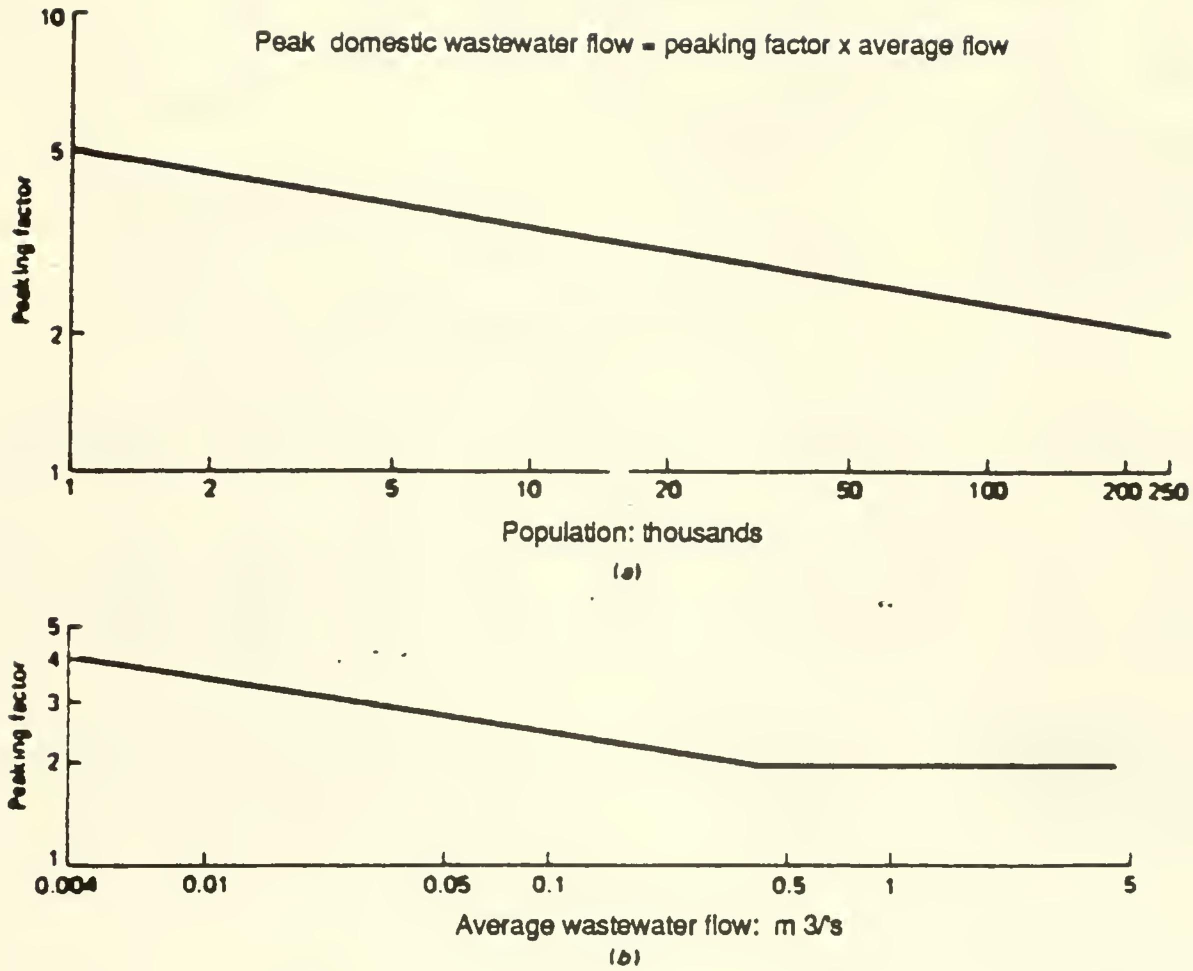
There are a number of low pressure, high pressure, and dedicated high pressure fire service water mains in the streets contiguous to the site. Low pressure service lines typically supply sufficient water for one piece of fire fighting equipment or 3,000 gallons per minute with auxiliary pumping. A high service hydrant normally delivers 3,000 to 4,000 gallons per minute without pumping. Up to five times that amount can be pumped from a high service line.

Availability of water for fire fighting purposes must be verified with hydrant tests in the immediate vicinity. This includes the determination of the residual pressure in the system with an adjacent hydrant fully open. The difference between static and residual pressure is typically 5 psi. During hydrant use with pumping apparatus, negative system pressures must be avoided. Pressures less than 10 psi indicate maximum usage and additional loads should be avoided.

Regionally, water usage must be curtailed to the extent reasonably feasible. Currently, the Massachusetts Water Resources Authority draws 320 million gallons per day, which exceeds the maximum safe yield of 300 million gallons per day. Although the approximately 100,000 gallons per day projected for the site represents only 0.03% of the total daily draw from the reservoirs, conservation measures must be implemented to assure that this projected rate is achieved.

Electricity

The maximum impact on electrical services in the project vicinity would result from the development of all-electric high rise buildings on the sites. Over the past



Source: Wastewater Engineering: Treatment Disposal Reuse, McGraw-Hill, New York 1979

Figure IV D-1:
Water and Wastewater Flow Peaking Factors

TABLE IV D-6

Sewer Flow Summary
Kingston-Bedford Building

Flow	Alt. 1 mgd	Alt. 1 cfs	Alt. 2 mgd	Alt. 2 cfs	Alt. 3 mgd	Alt. 3 cfs	Alt. 4 mgd	Alt. 4 cfs	Alt. 5 mgd	Alt. 5 cfs	Alt. 6 mgd	Alt. 6 cfs
Avg. Dry	n	n	0.06	0.09	0.05	0.07	0.04	0.06	0.04	0.07		
Peak Dry	0.01	0.02	0.23	0.36	0.21	0.32	0.17	0.26	0.19	0.29		
Storm	1.85	2.86	1.85	2.86	1.85	2.86	1.85	2.86	3.63	5.65		
Peak Wet	1.86	2.88	2.08	3.22	2.06	3.18	2.02	3.12	3.82	5.94		

Available sewers are:	Capacity is:
Bedford Street:	2.52 cfs
Columbia Street:	12.6 cfs
Kingston Street:	37.0 cfs

Lincoln-Essex Building

Flow	Alt. 1 mgd	Alt. 1 cfs	Alt. 2 mgd	Alt. 2 cfs	Alt. 3 mgd	Alt. 3 cfs	Alt. 4 mgd	Alt. 4 cfs	Alt. 5 mgd	Alt. 5 cfs	Alt. 6 mgd	Alt. 6 cfs
Avg. Dry	0	0	0.04	0.06	0.03	0.05	0.03	0.04	0.04	0.06		
Peak Dry	0	0	0.19	0.29	0.16	0.25	0.14	0.22	0.19	0.29		
Storm	1.39	2.16	1.39	2.16	1.39	2.16	1.39	2.16	1.43	2.23		
Peak Wet	1.39	2.16	1.58	2.45	1.55	2.41	1.53	2.38	1.62	2.52		

Available sewers are:	Capacity is:
Columbia Street:	12.6 cfs
Lincoln Street:	30.0 cfs
Essex Street:	52.0 cfs

Combined Site

Flow	Alt. 1 mgd	Alt. 1 cfs	Alt. 2 mgd	Alt. 2 cfs	Alt. 3 mgd	Alt. 3 cfs	Alt. 4 mgd	Alt. 4 cfs	Alt. 5 mgd	Alt. 5 cfs	Alt. 6 mgd	Alt. 6 cfs
Avg. Dry	n	n	0.10	0.15	0.08	0.12	0.07	0.10	0.09	0.13	0.09	0.13
Peak Dry	0.01	0.02	0.39	0.59	0.34	0.49	0.29	0.42	0.36	0.53	0.35	0.15
Storm	3.24	5.02	3.24	5.02	3.24	5.02	3.24	5.02	5.06	7.88	5.07	7.88
Peak Wet	3.25	5.04	3.63	5.61	3.58	5.51	3.53	5.44	5.42	8.41	5.42	8.39

Available sewers are:	Capacity is:
Surface Artery:	39 cfs
Purchase Street:	116 cfs

n = negligible

TABLE IV D-7

Quantification of Sewage Flow for Alternative 1

Description	Area Square Feet	Flow Gal/Day	Flow cfs
Kingston-Bedford			
Garage (750 spaces @ 5 gpd)		3,750	
Garage (10 empl @ 75 gpdpc)		750	
Total Flow		4,500	n
Peak Flow (720 uses per day per fac at 2 gal use/washbasin and 5 gal/use per water closet)		10,000	0.02
Storm Flow	27,427	-	2.86
Total Storm & Peak Flow		-	2.88
Lincoln-Essex			
Parking Lot (Sanitary Flow)		-	0.00
Storm Flow	20,747	-	2.16
Total Storm and Peak Flow		-	2.16
TOTAL SANITARY FLOW		4,500	n
TOTAL PEAK SANITARY FLOW		10,000	0.02
TOTAL DESIGN STORM FLOW	48,174	-	5.02
TOTAL PEAK/DESIGN STORM FLOW		-	5.04

TABLE IV D-8

Quantification of Sewage Flow for Alternative 2

Description	Area Square Feet	Flow Gal/Day	Flow cfs
Kingston-Bedford			
Retail Space			
Dry goods	13,000	650	
Restaurant	1,000	5,000	
Office Space	679,500	51,000	
Flow Subtotal		57,000	0.09
Peak Flow (PF = 4.1 for 3,500 persons)		234,000	0.36
Storm Flow	27,427	-	2.86
Total Storm & Peak Flow		-	3.22
Lincoln-Essex			
Retail Space			
Dry goods	7,000	350	
Restaurant	1,000	5,000	
Hotel 300 rooms @110 gal ea.		33,000	
Flow Subtotal		38,350	0.06
Peak Flow (PF = 5.0 for 750 persons)		192,000	0.29
Storm Flow	20,747	-	2.16
Total Storm & Peak Flow		-	2.45
Garage			
800 spaces @ 5 gpd each		4,000	
10 employees @ 75 gpdpc		750	
Flow Subtotal		4,750	
Peak Flow (same as Alt. 1)		10,000	0.02
TOTAL SANITARY FLOW		100,100	0.15
TOTAL PEAK SANITARY FLOW* (PF = 3.9 for 4,250 persons)		390,000	0.59
TOTAL DESIGN STORM FLOW*	48,174	-	5.02
TOTAL PEAK/DESIGN STORM FLOW		-	5.61

* Peak flow for individual buildings as well as the whole project are shown because individual buildings will discharge to specific lateral sewers. The peak flows are not additive because a the contributing population increases, the peaking factor goes down. This is standard engineering practice.

TABLE IV D-9

Quantification of Sewage Flow for Alternative 3

Description	Area Square Feet	Flow Gal/Day	Flow cfs
Kingston-Bedford			
Retail Space			
Dry Goods	13,000	650	
Restaurant	1,000	5,000	
Office Space	554,000	41,550	
Flow Subtotal		47,200	0.07
Peak Flow (PF = 4.3 for 2,875 persons)		205,000	0.32
Storm Flow	27,427	-	2.86
Total Storm & Peak Flow		-	3.18
Lincoln-Essex			
Retail Space			
Dry Goods	11,000	550	
Restaurant	1,000	5,000	
Hotel 240 rooms @ 110 gal ea.		26,400	
Flow Subtotal		31,950	0.05
Peak Flow (PF = 5.0 for 600 persons)		160,000	0.25
Storm Flow	20,747	-	2.16
Total Storm & Peak Flow		-	2.41
Garage			
600 spaces @ 5 gpd each		3,000	
10 employees @ 75 gpdpc		750	
Flow Subtotal		3,750	
Peak Flow (same as Alt. 1)		10,000	0.02
TOTAL SANITARY FLOW		83,350	0.12
TOTAL PEAK SANITARY FLOW* (PF = 4.1 for 3,475 persons)		342,000	0.49
TOTAL DESIGN STORM FLOW	48,174	-	5.02
TOTAL PEAK/DESIGN STORM FLOW*		-	5.51

* Peak flow for individual buildings as well as the whole project are shown because individual buildings will discharge to specific lateral sewers. The peak flows are not additive because as the contributing population increases, the peaking factor goes down. This is standard engineering practice.

TABLE IV D-10

Quantification of Sewage Flow far Alternative 4

Description	Area Square Feet	Flow Gal/Day	Flow cfs
Kingston-Bedford			
Retail Space			
Dry Goods	13,000	650	
Restaurant	1,000	5,000	
Office Space	429,000	32,200	
Flow Subtotal		37,850	0.06
Peak Flow (PF = 4.4 for 2,250 persons)		167,000	0.26
Storm Flow	27,427	-	2.86
Total Storm & Peak Flow		-	3.12
Lincoln-Essex			
Retail Space			
Dry Goods	11,000	550	
Restaurant	1,000	5,000	
Hotel 200 rooms @ 110 gal ea.		22,000	
Flow Subtotal		27,550	0.04
Peak Flow (PF=5.0 for 500 persons)		138,000	0.22
Storm Flow	20,747	-	2.16
Total Storm & Peak Flow		-	2.38
Garage			
600 spaces @ 5 gpd each		3,000	
10 employees @ 75 gpdpc		750	
Flow Subtotal		3,750	
Peak Flow (same as Alt. 1)		10,000	0.02
TOTAL SANITARY FLOW		69,000	0.10
TOTAL PEAK SANITARY FLOW*		290,000	0.42
(PF= 4.2 for 2,750 persons)			
TOTAL DESIGN STORM FLOW*	48,174	-	5.02
TOTAL PEAK/DESIGN STORM FLOW		-	5.44

* Peak flow for individual buildings as well as the whole project are shown because individual buildings will discharge to specific lateral sewers. The peak flows are not additive because as the contributing population increases, the peaking factor goes down. This is standard engineering practice.

TABLE IV D-11

Quantification of Sewage Flow for Alternative 5

Description	Area Square Feet	Flow Gal/Day	Flow cfs
Kingston-Bedford			
Retail Space			
Dry Goods	21,000	1,050	
Restaurant	1,000	5,000	
Office Space	510,000	38,250	
Flow Subtotal		44,300	0.07
Peak Flow (PF = 4.3 for 2,800 persons)		190,500	0.29
Storm Flow	54,225	-	5.65
Total Storm & Peak Flow		-	5.94
Lincoln-Essex			
Retail Space			
Dry goods	7,000	350	
Restaurant	1,000	5,000	
Hotel 300 rooms @ 110 gal ea.		33,000	
Flow Subtotal		38,350	0.06
Peak Flow (PF= 5.0 for 890 persons)		192,000	0.29
Storm Flow	21,439		2.23
Total Storm & Peak Flow		-	2.52
Garage			
800 spaces @ 5 gpd each		4,000	
10 employees @ 75 gpdpc		750	
Flow Subtotal		4,750	
Peak Flow (same as Alt. 1)		10,000	0.02
TOTAL SANITARY FLOW		87,400	0.13
TOTAL PEAK SANITARY FLOW* (PF = 4.1 for 3,690 persons)		358,000	0.53
TOTAL DESIGN STORM FLOW	75,664	-	7.88
TOTAL PEAK/DESIGN STORM FLOW*		-	8.41

* Peak flow for individual buildings as well as the whole project are shown because individual buildings will discharge to specific lateral sewers. The peak flows are not additive because as the contributing population increases, the peaking factor goes down. This is standard engineering practice.

TABLE IV D-12

Quantification of Sewage Flow for Developer's Proposal

Description	Area Square Feet	Flow Gal/Day	Flow cfs
Kingston-Bedford & Lincoln-Essex			
Retail Space			
Dry Goods	51,000	2,550	
Restaurant	3,0001	5,000	
Office Space	892,000	6,900	
Flow Subtotal		84,450	0.13
Peak Flow (PF = 3.9 for 4,600 persons)		329,400	0.51
Storm Flow	75,664	-	7.88
Total Storm & Peak Flow		-	8.39
Garage			
891 spaces @ 5 gpd each		4,460	
10 employees @ 75 gpdpc		750	
Flow Subtotal		5,210	
Peak Flow (same as Alt. 1)		10,000	0.02
TOTAL SANITARY FLOW		89,660	0.13
TOTAL PEAK SANITARY FLOW* (PF = 3.9 for 4,600 persons)		350,000	0.51
TOTAL DESIGN STORM FLOW	75,664	-	7.88
TOTAL PEAK/DESIGN STORM FLOW*		-	8.39

* Peak flow for individual buildings as well as the whole project are shown because individual buildings will discharge to specific lateral sewers. The peak flows are not additive because as the contributing population increases, the peaking factor goes down. This is standard engineering practice.

fifteen years, virtually all downtown highrise construction has been all-electric. This is due to the high cost of installing heating systems utilizing steam, oil, or gas.

The proposed complex cannot be serviced directly from the 4 kV distribution system, but must be supplied from the 13.8 kV distribution system. For each development alternative (except the No Build) a new internal vault will be required on private property. This vault would transform the 13.8 kV power from the network feeder system into the 277/408 V and 120/208 V systems for building use.

The additional load on the power generating equipment would be distributed between the nuclear facility in Plymouth and the nearby oil/gas fired facilities in Everett and South Boston. The increase in demand represents 0.4% of the current peak demands or 0.35% of the total generating capacity of the Mystic, New Boston, and Pilgrim power plants. This load represents about 5% of the current excess capacity. The additional pollutant loading on the atmosphere is comparable to the increase in demand, as are the additional disposal requirements for ash and radioactive wastes. These additions are minimal relative to existing discharges.

With the completion of the North/Downtown Transmission Reinforcements project, there will be sufficient capacity to serve the electrical requirements of the proposed Kingston-Bedford-Essex Street project as well as other future developments in downtown Boston.

Gas

The gas requirements of up to 11,900 cfh (for Alternative 5) can generally be met with the existing system. If demand exceeds capacity, adjustments to the distribution system would be made on a case-by-case basis as connection applications are received. This determination may be made only upon accurate assessment of the projected demand by the developer.

Steam

For the largest alternative (Alternative 6), demand represents approximately ten percent of the available capacity. Actual demand will be dependent on such factors in building as materials, insulation factors, ventilation, volume, surface areas, internal heat generation, and solar gain.

The demand of 100,500 pounds per hour represents an 8.75% increase in demand and a consequent increase in fuel consumption at the Kneeland Street, Minot Street, and Scotia Street steam generating stations. Overall impacts on air quality would be distributed among the three plant locations, none of which directly impact the site. Pollution abatement practices and capabilities at the individual plants would accommodate the additional load while complying with environmental requirements.

Sewer System

The combined sewers that are located in the project area are designed to discharge flow to a regulator south of Northern Avenue along the Fort Point Channel. The regulator is a bulkhead which allows excess storm flow to pass over it. Theoretically, overflow is clear storm water while the underflow is the sanitary por-

tion of the flow diluted with stormwater. The overflow is discharged to the Fort Point Chanel via CSO No. BOS-062 while the underflow passes into the East Side Interceptor.

Although combined sewer overflow (CSO) events should be limited to wet weather conditions, they can, and at other CSO outlets do, occur with varying frequency during dry weather. Dry weather overflow has not been reported for BOS-062 (CH2M Hill, 1987). In the past, the sewers have been routinely surcharged due to the infiltration of tidal groundwater and inflow at faulty tidegates. The degree and frequency of these CSO events has been reduced significantly with the replacement and rehabilitation of the East Side Interceptor regulators and tidegates.

The existing sewers serving the project site, as designed, can accommodate the flows projected for the development. In each case, dry weather peak flow represents 1 percent or less of the sewage capacity. Alternative 1 (No Build) would have no additional impacts on the sewerage system or any surface waters.

The proposed development will result in a significant increase in the average daily sanitary flows from the project site. It can be anticipated that some degradation of wet weather combined sewer overflow quality could occur, although the frequency and quantity should be greatly reduced because of recently-completed sewer improvements. The storm flow will be unaffected because the sites remain nearly 100% impervious in each alternative.

The estimated peak dry weather sanitary flows will constitute approximately 0.6% of the estimated design capacity of the Essex Street sewer and 0.5% of the estimated design capacity of the Purchase Street trunk sewer. This impact is negligible for sewers operating without substantial infiltration or excess inflow. Lateral and branch sewers in the streets contiguous to the development sites also have sufficient capacity to accommodate dry weather flow.

During wet weather, any combined sewer overflows would be marginally degraded. The extent of degradation would be dependent on the percent contribution of the site to the total flow passing into the regulator. The degree of degradation is also dependent on the correlation of high tide and peak sanitary flow as well as intensity and duration of any wet weather conditions. These impacts are due to the nature of combined sewers, the operation of combined sewer overflows into surface waters, and the integrity of the associated tidegates, sewers, and other sewer structures.

The quality of CSO discharges at BOS-062 into the Fort Point Channel would be most affected under Alternative 2. Alternatives 3, 4, 5, and 6 would produce reduced impacts of a similar nature.

The impact of this project for all alternatives on the discharge to the Deer Island Treatment Plant would be negligible. The average daily flow generated by the development represents less than 0.05% of the total current flow into the Deer Island Plant. Upon completion of the upgrading of the plant, the average daily contribution of the proposed development would represent 0.01% of the plant capacity.

TABLE IV D-13

Design Storm Runoff*

Site	Size Sq.Ft.	Flow cfh	cfm	cfs	gps
Kingston-Bedford	27,427	10,320	172	2.86	21.4
Lincoln-Essex	20,747	7,800	130	2.16	16.1
Total	48,174	18,120	302	5.02	37.5

* Basic storm runoff information for use in projecting peak storm flow for each alternative. For Alternatives 5 and 6, site size increases to 75,664 sq.ft., increasing the total flow to 59.0 gps.

Mitigation Measures

Water

To reduce the site's water usage and comply with the State Plumbing Code, water saving plumbing fixtures must be installed. These include flow restricting nozzles for sinks and flush valves for water closets and urinals. A program of leak prevention and maintenance should be implemented to avoid wastage. These measures, coupled with other government programs to improve water conservation and efficiencies (such as the MWRA Drought Management Plan) and to increase the supply of water, provide the type of mitigations that should ultimately eliminate the shortfall in water supply.

Electricity

The BRA requires that energy efficient technologies be adopted in the design of buildings. This requirement, along with those required by the Massachusetts State Building Code, should insure that the selected alternative is developed with the minimum possible energy demand. Such conservation will enable the project to be built with minimal additional contribution to the overall demand on energy suppliers.

Gas

No mitigating measures are necessary to reduce any adverse impacts. Nonetheless, installation of energy efficient equipment, as required by the Commonwealth of Massachusetts Energy Code, would reduce any potential for such impacts.

Steam

Although there are no measurable adverse impacts, efficient energy use is, nonetheless, required by the Commonwealth of Massachusetts Energy Code. Use of steam for heating needs, if selected, should be coupled with its use for cooling requirements as well.

Sewer System

Continued renewal of the sewer system through rehabilitation and replacement of trunk sewers will reduce the impact of the combined sewer overflows into the surface waters surrounding Boston. A CSO treatment facility has been suggested for the Fort Point Channel area, although no plans for construction have been finalized.

Reduction of overall sewage flow would reduce impacts on wet weather overflow discharge quality at CSO BOS-062. Installation of water-saving devices, including flow controls for wash basins, flush valve waterclosets and urinals, and other plumbing requirements as per the Commonwealth of Massachusetts Plumbing Code, would reduce overall sewage flow to the greatest extent practicable. Continued maintenance to minimize leakage and other wasteful conditions also would avoid increasing the impacts with time.

E. MASSING AND SHADOWS

Description of the Environment

Massing/Visual Quality

The project site currently has a paved surface parking lot on the Essex Street block and a nine-story mechanical garage on the northern half of the Kingston-Bedford Street block. The Bedford Building, a five-story masonry structure, is located on the northern half of the Essex Street block. Two five-story brick buildings are located on the southern half of the Kingston-Bedford Street block and are representative of the scale and mass of buildings found to the south of the site in the Kingston-Essex Street Textile District. These properties are shown by photos of the site in Figure IV E-1.

In terms of building height and mass, the project site serves as a transition area between the tall buildings found in the Financial District and the smaller buildings of Chinatown and the Kingston-Essex Textile District. Figure IV E-2, a pair of computer generated perspectives, illustrates the existing views of the site from Chinatown to the southwest and from the Leather District across the Central Artery to the southeast. These views provide additional illustrations of the transitional nature of the site with respect to building heights and overall massing characteristics in the area. To document the existing streetscape surrounding the project site, photos were taken along each street adjacent to the site.

Bedford Street (see Figure IV E-3)

On the north side of the project site, Bedford Street is characterized by a mix of new construction, such as 99 Summer Street and older historic buildings, including the Bedford Building, Proctor Building, and Church Green Building. The height of buildings varies greatly from the three-story Proctor Building to the twenty-story 99 Summer Street. Street level facades are a mix of stone, masonry and concrete. Building walls consistently meet the sidewalk edge with wide variations in entry and window treatments.

Essex Street (see Figure IV E-3)

Essex Street marks the southern boundary of the project site and is a heavily travelled vehicular roadway. Typified by five- to six-story brick structures and open lots adjacent to and on the project site, Essex Street exhibits much taller structures further east and west of the project site. Buildings typically come to the sidewalk line, creating setbacks from the street of eight to ten feet.

Kingston Street (see Figure IV E-4)

Defining the western boundary of the project site, Kingston Street exhibits diverse building heights and styles, as defined by two five-story brick buildings, the nine-story parking garage on the project site, and a 95 foot high Boston Edison substation across Kingston Street from the project site. The Kingston Street corridor is generally characterized by five- to six-story brick buildings. North of Bedford Street are a wide variety of buildings with heights typical of the Financial District. The Proctor Building, located at the Kingston Street/Bedford Street intersection,

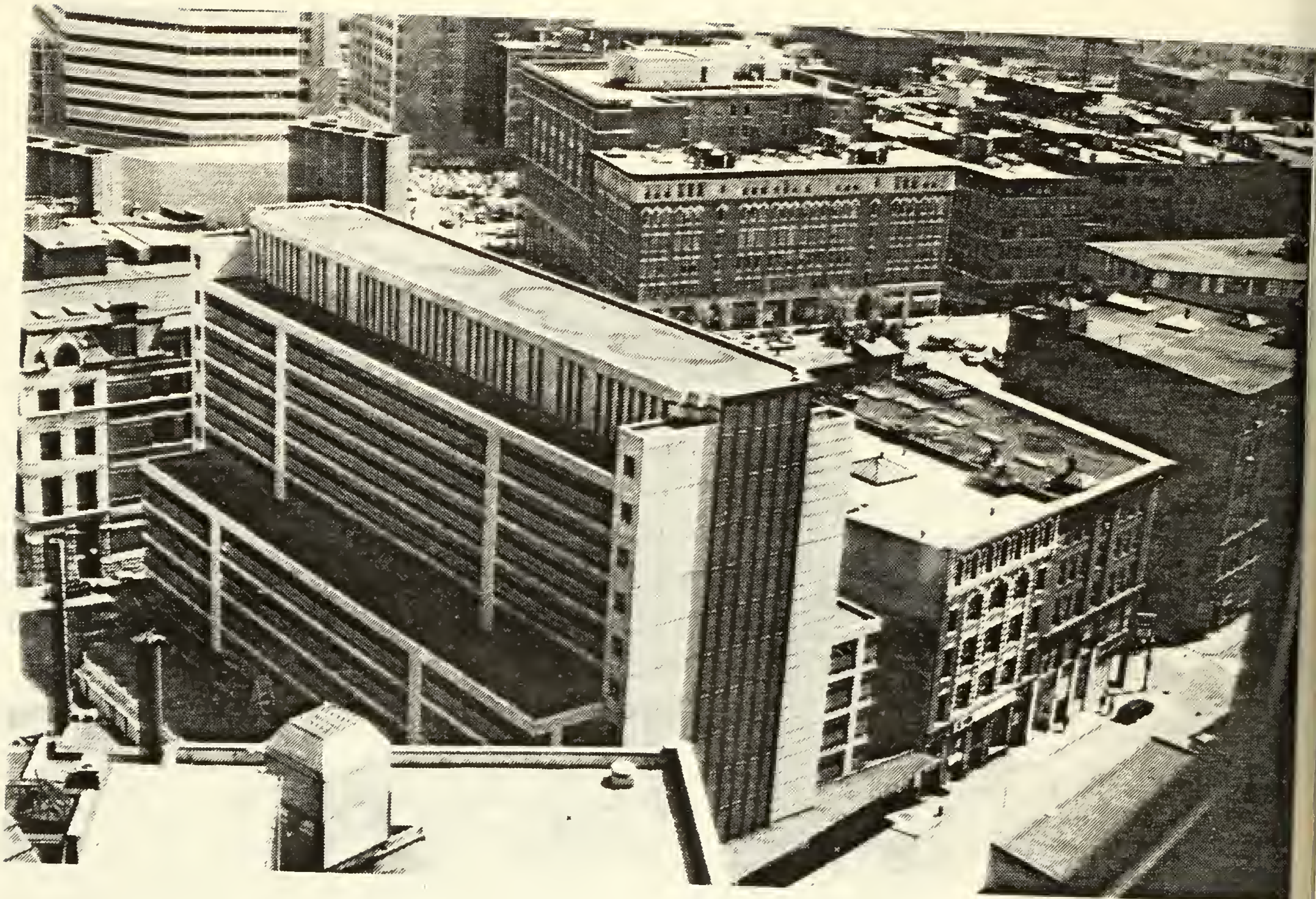
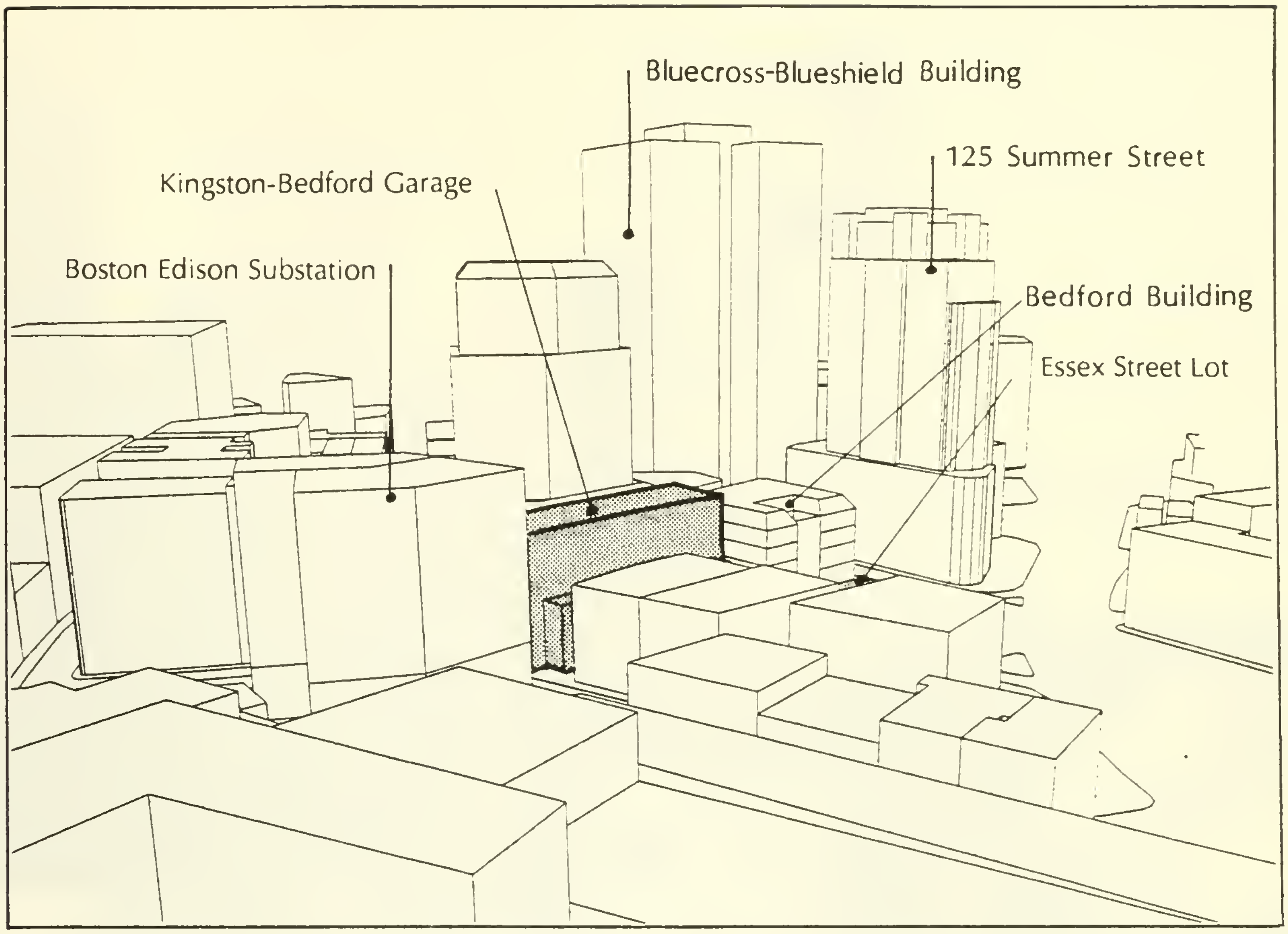


Figure IV E-1:
Existing Conditions

View from Chinatown



View from Leather District

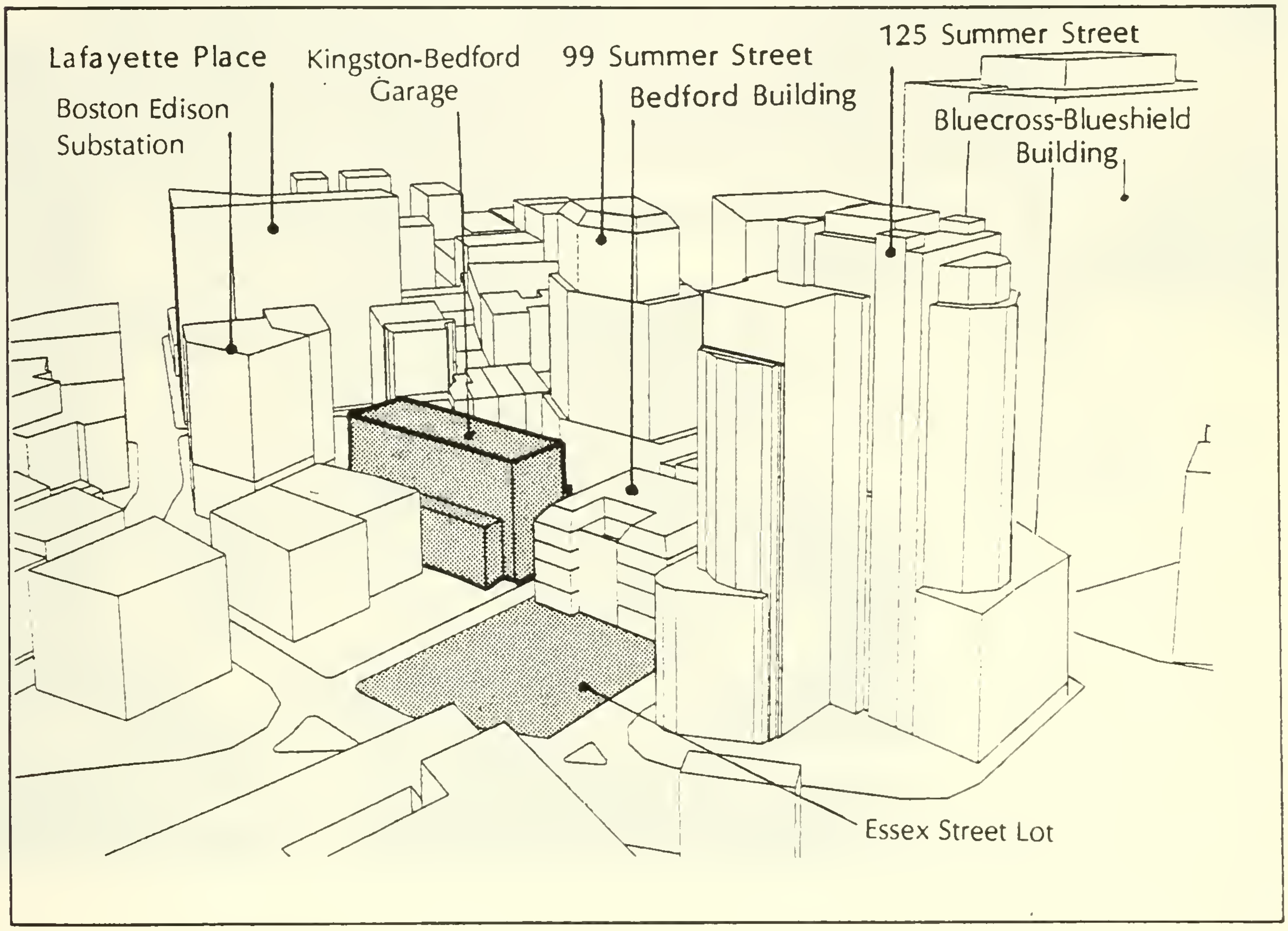


Figure IV E-2:
Perspective Views

Bedford Street
Looking East

Essex Street
Looking East

Figure IV E-3:
Bedford-Essex Streets
Existing Conditions

Kingston Street
Looking South

Figure IV E-4:
Kingston Street
Existing Conditions

has a distinct architectural style, is small in massing and low in height. Except for the irregular geometry associated with the Boston Edison substation, buildings typically meet the sidewalk line with no additional setbacks from the street.

Lincoln Street (see Figure IV E-5)

Adjacent to the east of the project site, buildings along Lincoln Street include the four-story Bedford Building and several six-story older mercantile buildings opposite the project site. This area, however, is also the site of the 125 Summer Street mixed-use office building, which is currently under construction. Maintaining the facades of the existing six-story buildings as a base, this project will have a tower that rises to 23 stories. The building will be set back ten feet from Lincoln Street.

Shadows

Analysis of existing seasonal shadow conditions on and around the site has been undertaken on the sensitive receptor locations listed below. These locations represent areas heavily used by pedestrians for walking and sitting. The shadow sensitive areas, as shown in Figure IV E-6, include:

- Bedford Street
- Columbia Street
- Lincoln Street
- Summer Street
- Church Green
- Dewey Square
- Downtown Crossing
- Boston Common

Morning, noon, and afternoon shadows were projected for four times during the year: the winter solstice (December 22) which is the day when the sun is the lowest and the shadows are the longest; the spring and autumn equinoxes (March 21 and September 21 respectively) representing the midpoint in the sun's path; and the summer solstice (June 22) when the sun is the highest and the shadows are the shortest.

When analyzing shadow impacts, it should be noted that these dates represent the extremes and that the movement of the sun is a continuous cycle. Days clustered around these dates will result in shadows which are more or less similar, depending upon where they lie in the continuum. Daylight savings time represents a shift forward by one hour, and therefore results in a slight shift in the location of shadows when compared to standard time. For the general purposes of this analysis, daylight savings time was not accounted for in the June 22 graphics. In the same regard, the March shadows shown in the analysis are roughly equivalent to September shadows, although due to daylight savings time the September shadows would be slightly west of those shown for March.

Figure IV E-5:
Lincoln Street
Existing Conditions

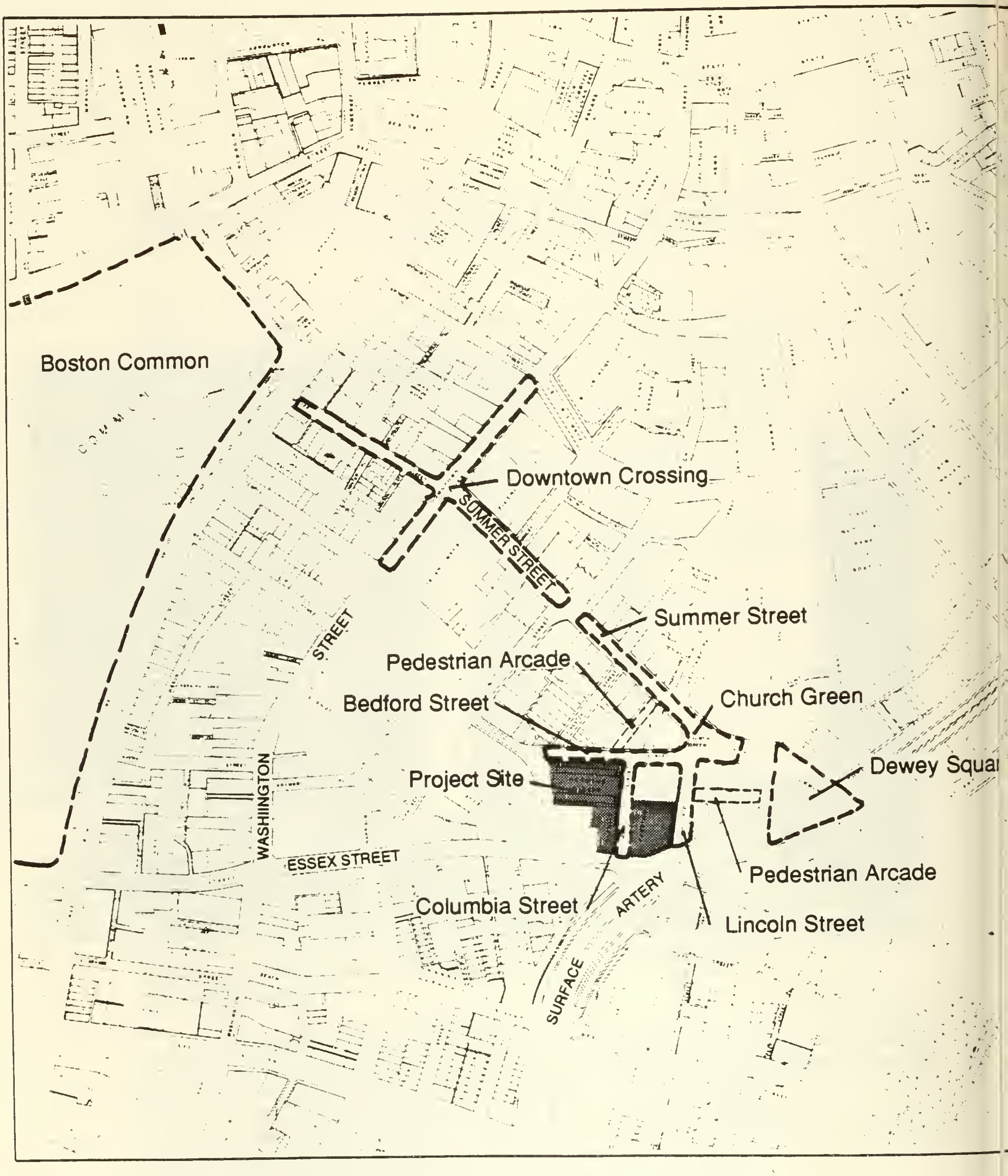


Figure IV E-6:
Shadow Sensitive Areas
(Existing Conditions)

The daily sequence of shadow effects is best illustrated during three times of the day: morning (9 AM), midday (noon), and afternoon (3 PM).

After determining the altitude and compass bearing of the sun for the site latitude at the noted times during the year, computer-generated images were created to simulate the location and extent of shadows cast by the existing buildings that are within the shadow range of the proposed alternatives. These existing shadows may be seen on the shadow studies of the various alternatives (Figures IV E-26 through IV E-70).

The project site is located in downtown Boston where there are a substantial number of existing midrise and highrise buildings. The highrise buildings include One Financial Center to the southeast, 125 Summer Street to the east, 99 Summer Street to the north, the Blue Cross-Blue Shield Building to the northeast, and the Lafayette Hotel to the northwest of the site. The existing shadows of these buildings and the shadows of other numerous five- to seven-story structures in the immediate vicinity of the project cause a substantial amount of the ground surface to be in shadow throughout the year. However, they are most pronounced during the winter months. The existing nine-story Kingston-Bedford block also casts significant shadows on the adjacent streets to the northwest, north and northeast during various periods of the day. The areas within the project site currently used as surface parking lots cast no shadows. Existing shadow impacts on nearby shadow sensitive areas are discussed below.

- **Bedford Street** - Portions of Bedford Street directly north of the project site are currently in shadow during most of the year. The western portion of Bedford Street north of the Boston Edison substation is also in shadow during spring and fall mornings. However, there are no existing shadows along Bedford Street during June, from noon through the late afternoon.

- **Columbia Street** - Columbia Street is in sun at noontime throughout the year. The northern portion of this street is in shadow during the morning and afternoon while the southern portion generally remains in sun.

- **Lincoln Street** - East of the Essex Street lot, Lincoln Street is in sun throughout the year. East of the Bedford Building, it is in shadow during the morning and afternoons, but sunny at noontime.

- **Summer Street** - From late summer to early spring, this heavily used pedestrian area is in shadow for most of the day. It is in sun during the noon hours in mid-summer.

- **Church Green** - Church Green, a busy pedestrian crossing, is in partial or total sun during much of the year except in mid-winter, when it is almost completely shaded by existing buildings.

- **Dewey Square** - Dewey Square is shaded by One Financial Center during much of the year, except during early morning hours.

- **Downtown Crossing** - Downtown Crossing is currently in shadow from morning through noon, during much of the year. The area is in sun during the afternoon for most of the year.

- **Boston Common** - Varying portions of Boston Common are in shadow from buildings along Tremont Street during the morning hours all year. Winter shadows are substantial along the main pedestrian walkways in

the early morning. By one o'clock most shadows are gone from this area of the Common.

Comparison and Probable Impacts of the Alternatives

Massing/Visual Quality

This section identifies the effects of the Kingston-Bedford-Essex Street project on the massing and urban design qualities of the surrounding site environment. Each of the five build alternatives has been evaluated for its effect on the macro-scale and on the street level visual environment surrounding the site.

Macro-scale analysis focuses on the comparison of urban design features of citywide or neighborhood importance. This includes analyzing the overall building height and massing characteristics of Chinatown in relation to those of the Financial District. The macro-scale effect of the project is described through (1) two skyline sections showing the relative heights of the project alternatives to other buildings in the area, including Chinatown and the Financial District, and (2) two computer generated elevated perspective views of the site and environs for each alternative. The two sections illustrating the skyline cut across the site in a northeast/southwest and southeast/northwest direction. These sections are provided to document the height of the project alternatives as they compare to other buildings in the general vicinity of the site (see Figures IV E-8 to IV E-12). The perspectives are taken from elevated positions above Chinatown just to the southwest of the project site and above the Leather District, and southeast of the project site across the Surface Artery (see Figures IV E-13 to IV E-17). They document the essential height and mass characteristics of buildings on the site and in the immediate vicinity. Figure IV E-7 shows the location from which the section lines and the elevated perspectives were taken.

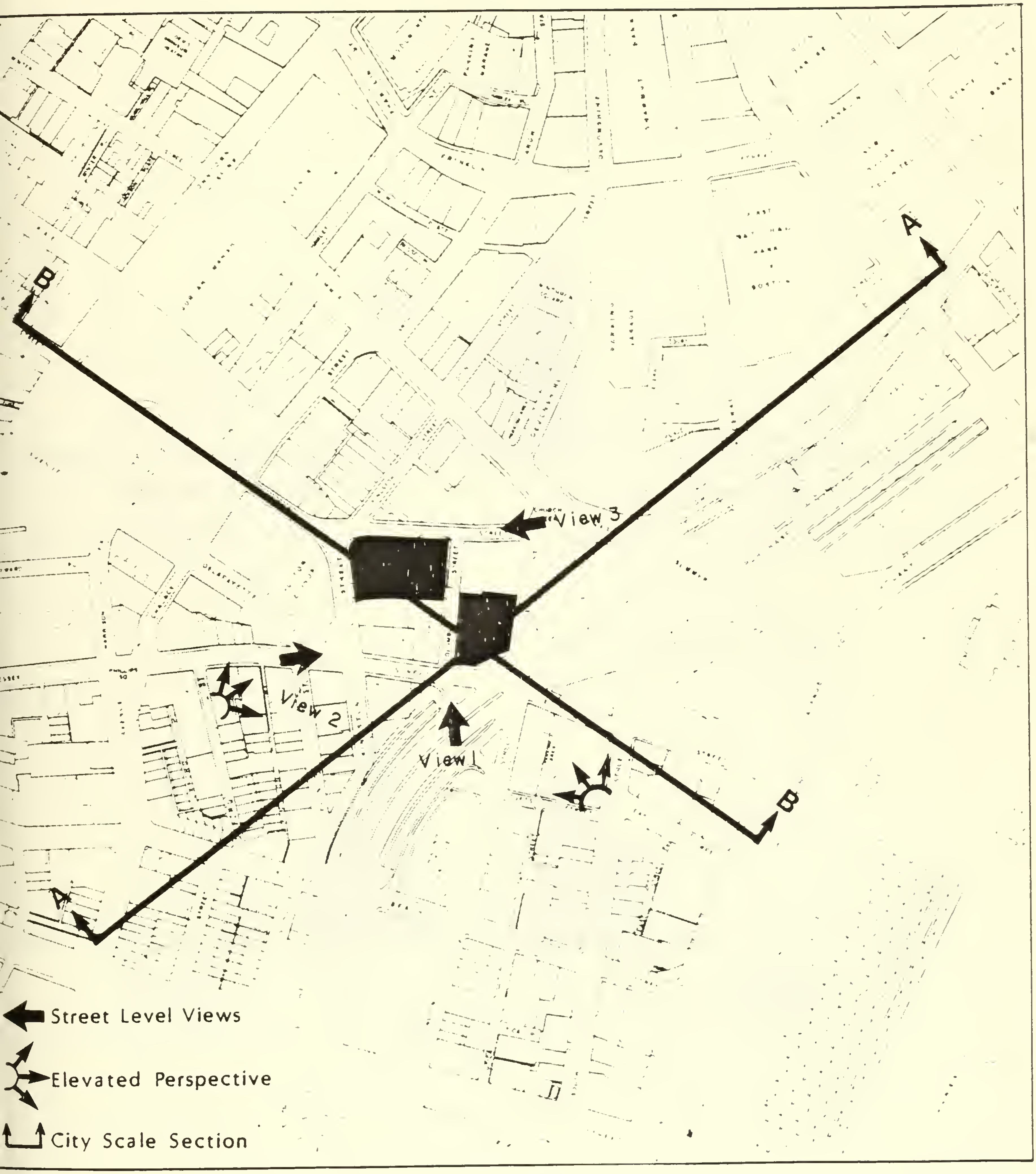
The location of the project site between the Financial District, comprised of office buildings with heights ranging up to 600 feet, and Chinatown and the Leather Districts, comprised of relatively uniform four- to six-story brick buildings, indicates that the site is in a transitional zone with respect to building mass and height on the Boston skyline.

No-Build

This alternative essentially represents a continuance of the present uses of the site.

400-ft. Tower (see Figure IV E-13)

Alternative 2 proposes a 400-foot tall building on the Kingston-Bedford Street block with a 21,000 sq.ft. floorplate at ground level. The height of this structure exceeds that of 125 Summer Street, the Lafayette Hotel, and 99 Summer Street although it is a similar in height to other buildings in the Financial District, as shown in Figure IV E-8. Similarly, the mass and bulk characteristics of the building is greater than that typified by many of the surrounding older buildings but is in the family of the newer office buildings in the area, such as the 100 Summer Street and One Financial Center buildings. The five-foot setback from the building base to the shaft appears to be insufficient to cause an effect on the overall massing of the proposed structure. These relationships are shown by the aerial perspectives



igure IV E-7:
iews and Sections Analyzed

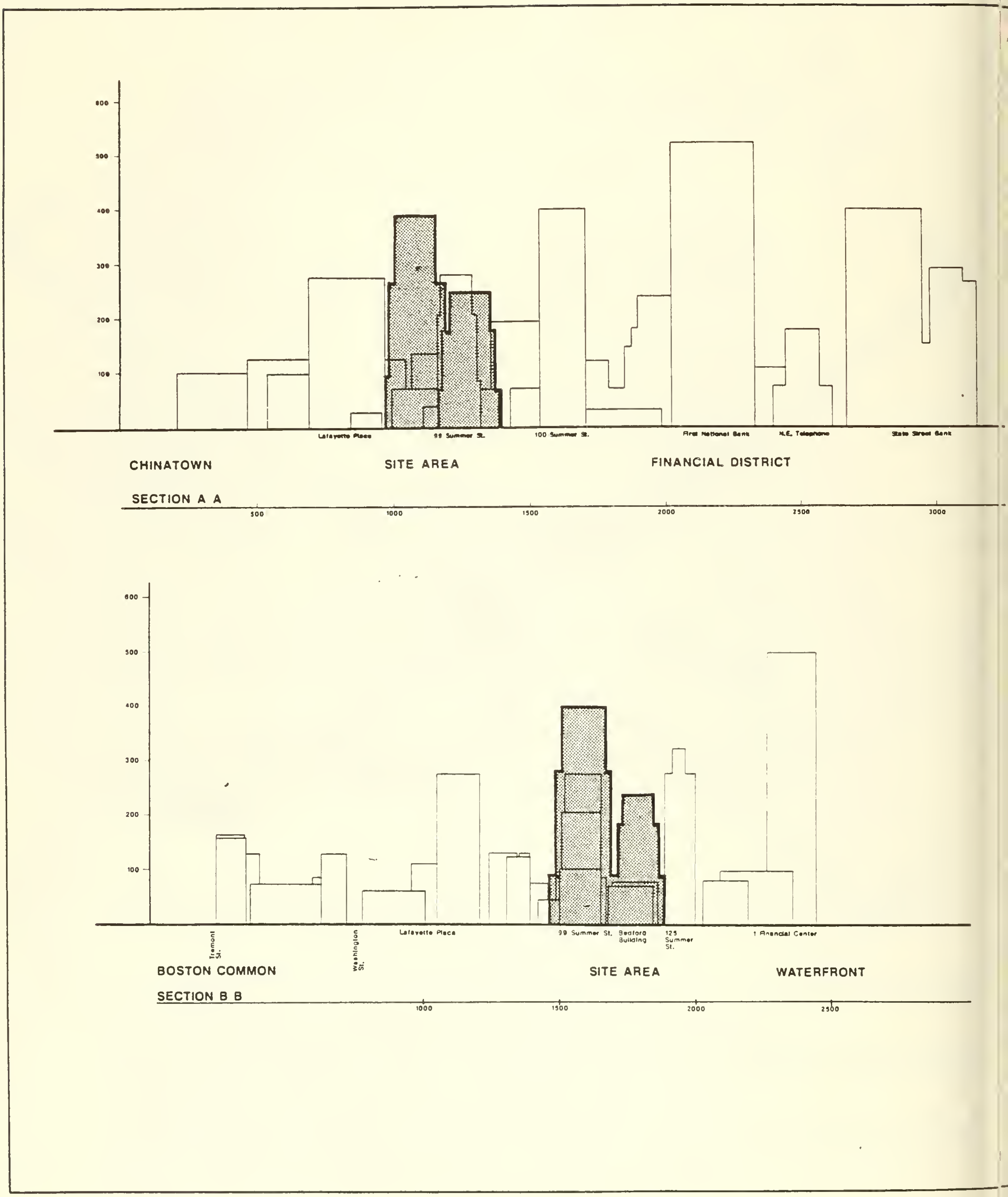


Figure IV E-8:
Site Sections Alternative 2

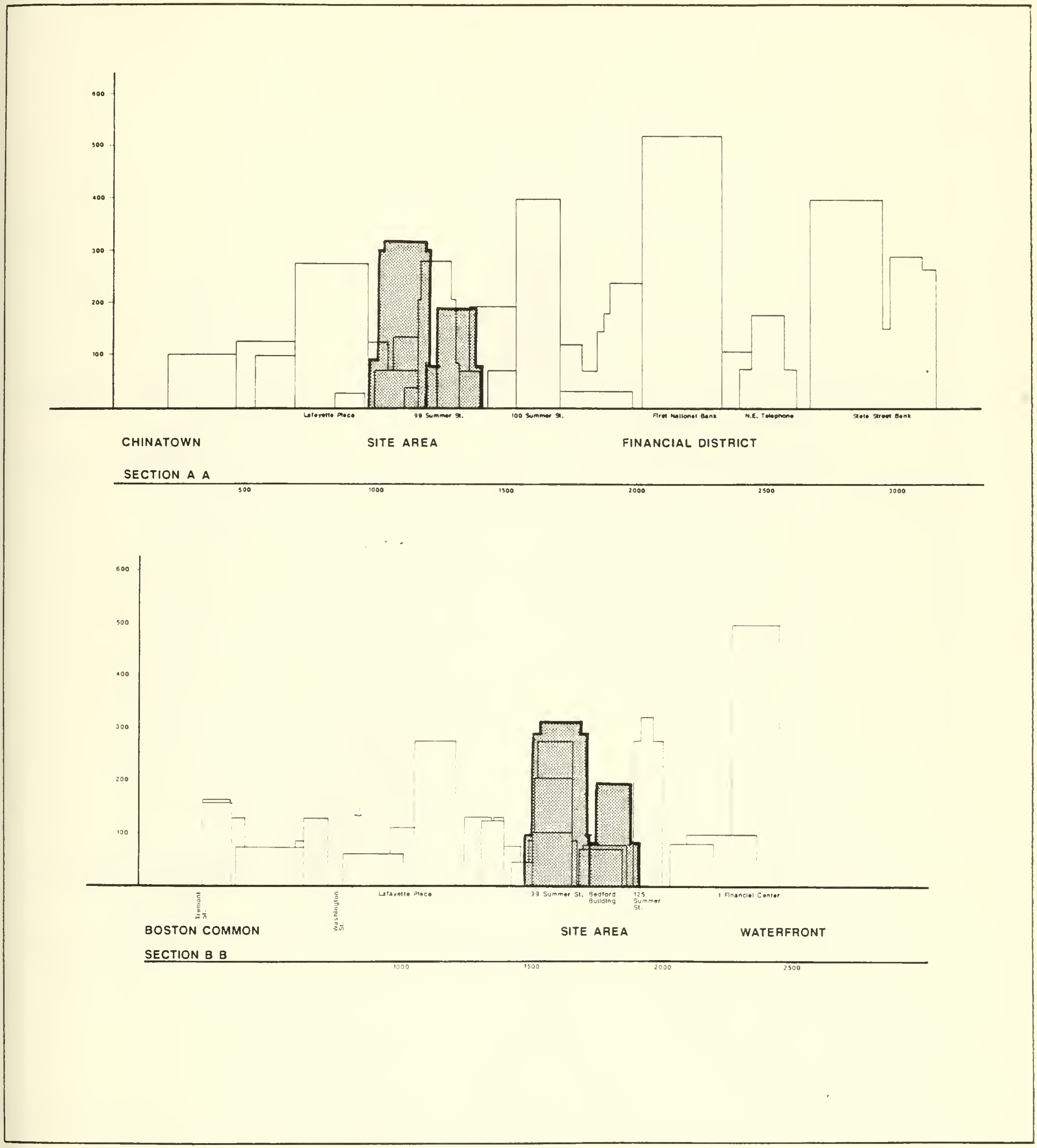


Figure IV E-9:
Site Sections Alternative 3

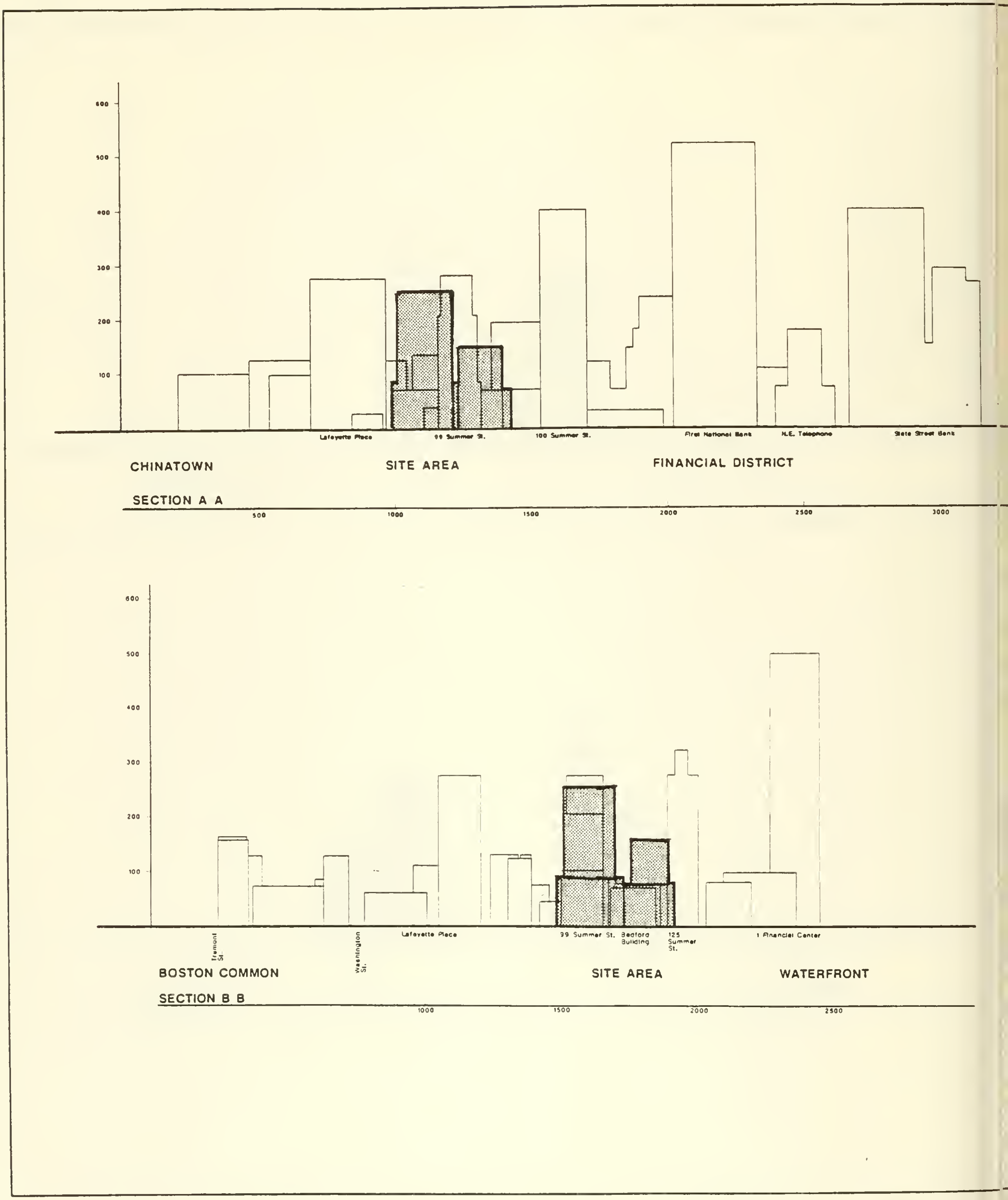


Figure IV E-10:
Site Sections Alternative 4

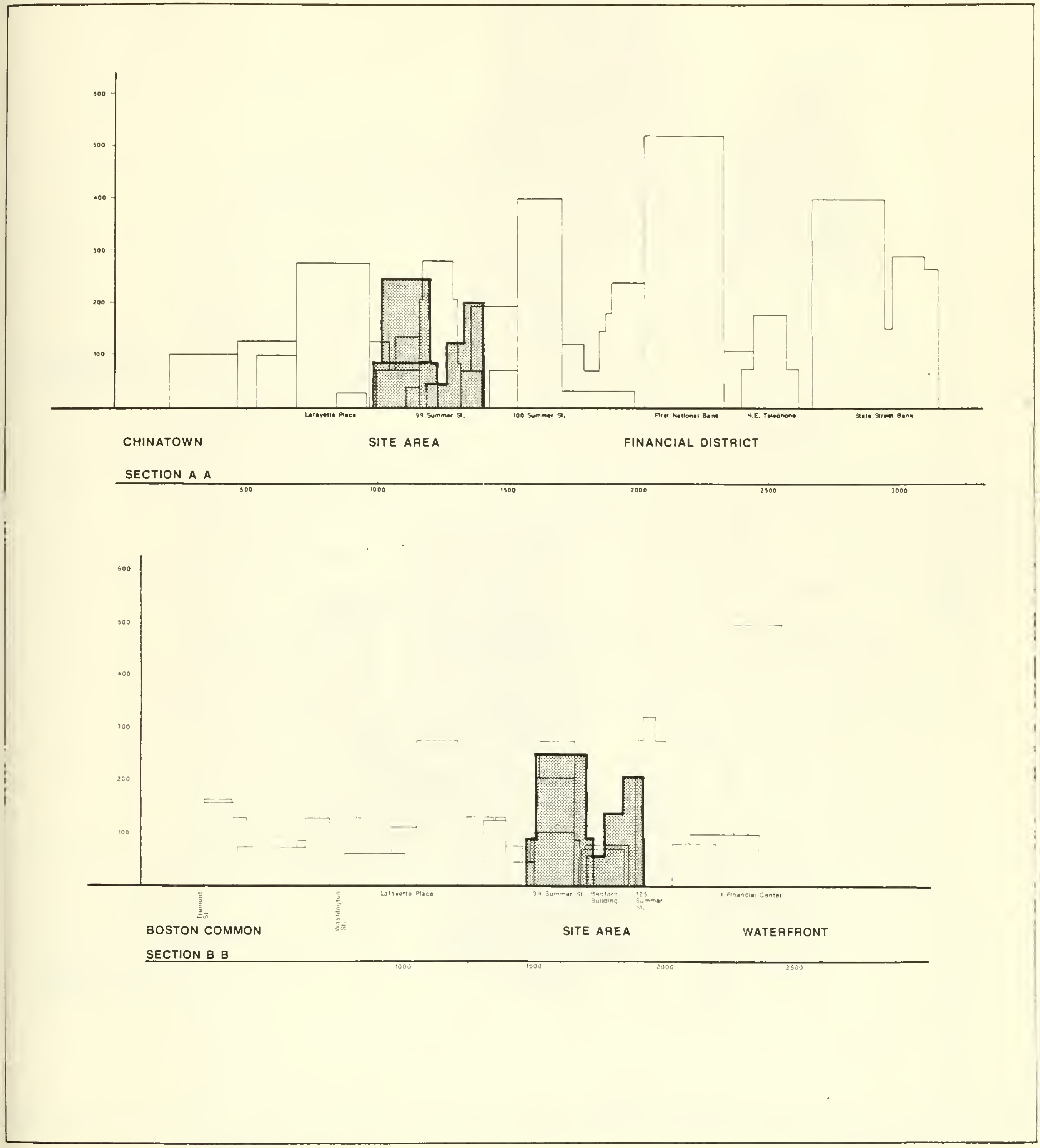


Figure IV E-11:
Site Sections Alternative 5

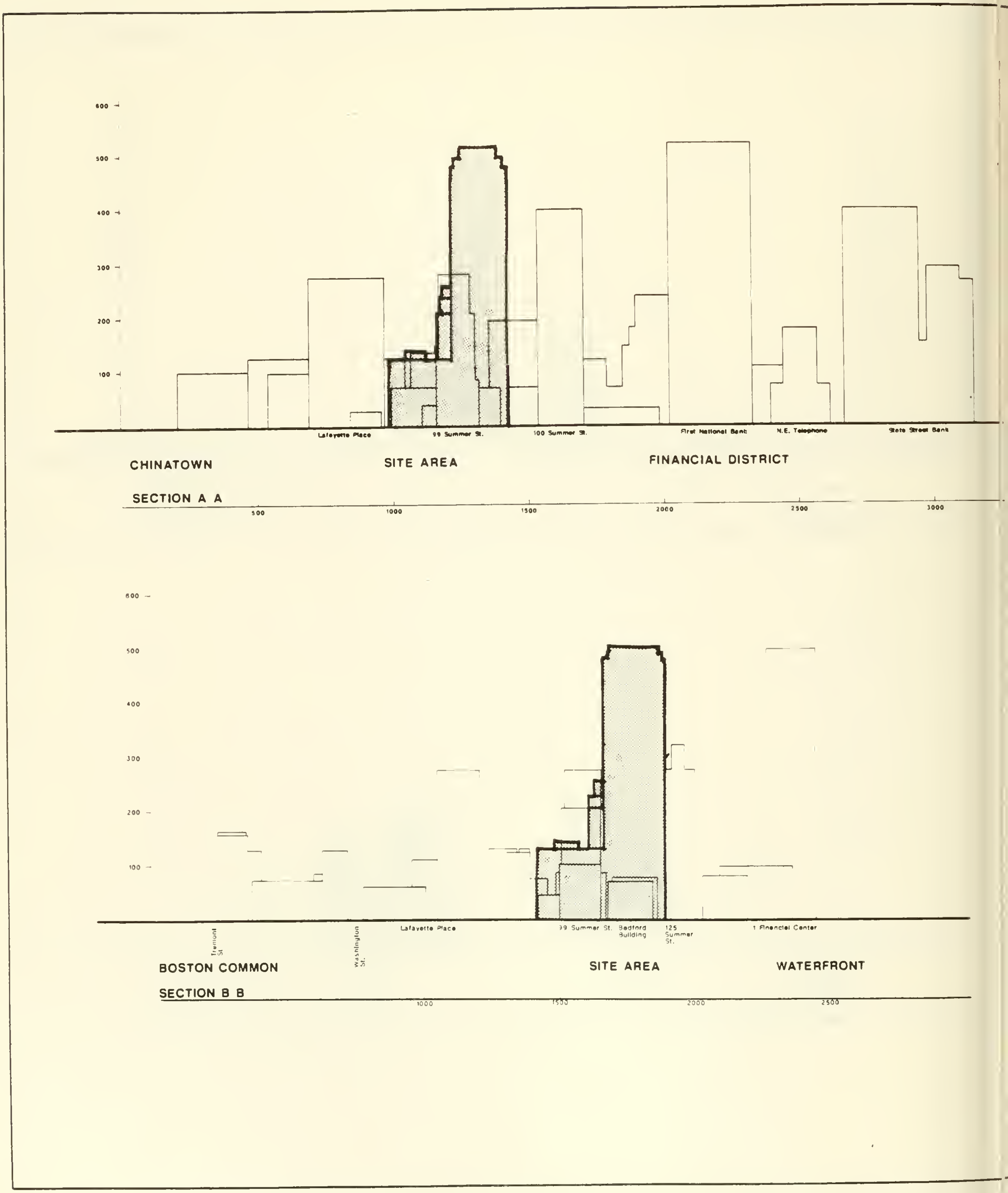
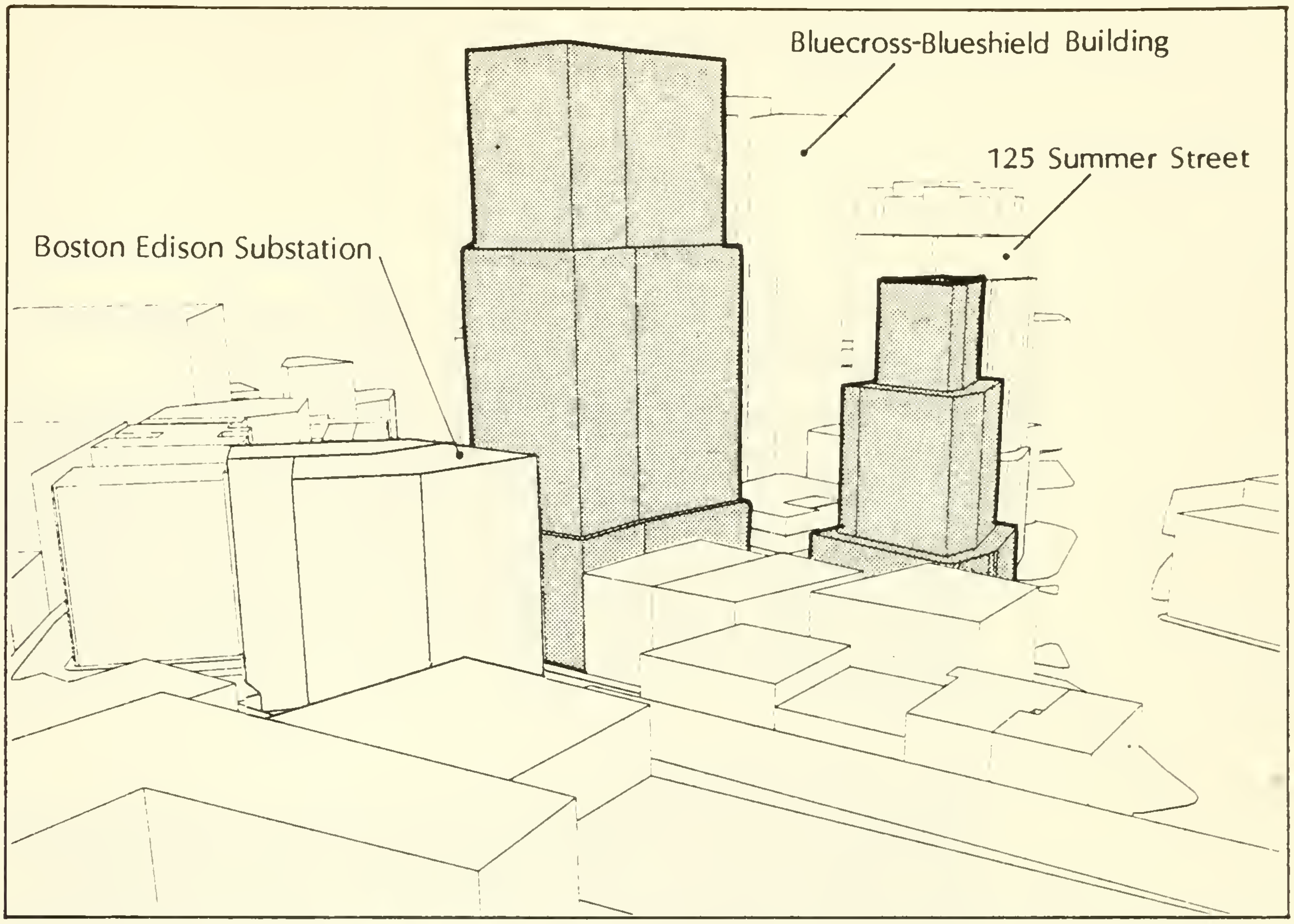


Figure IV E-12:
Site Sections Alternative 6

View from
Chinatown



View from
Leather District

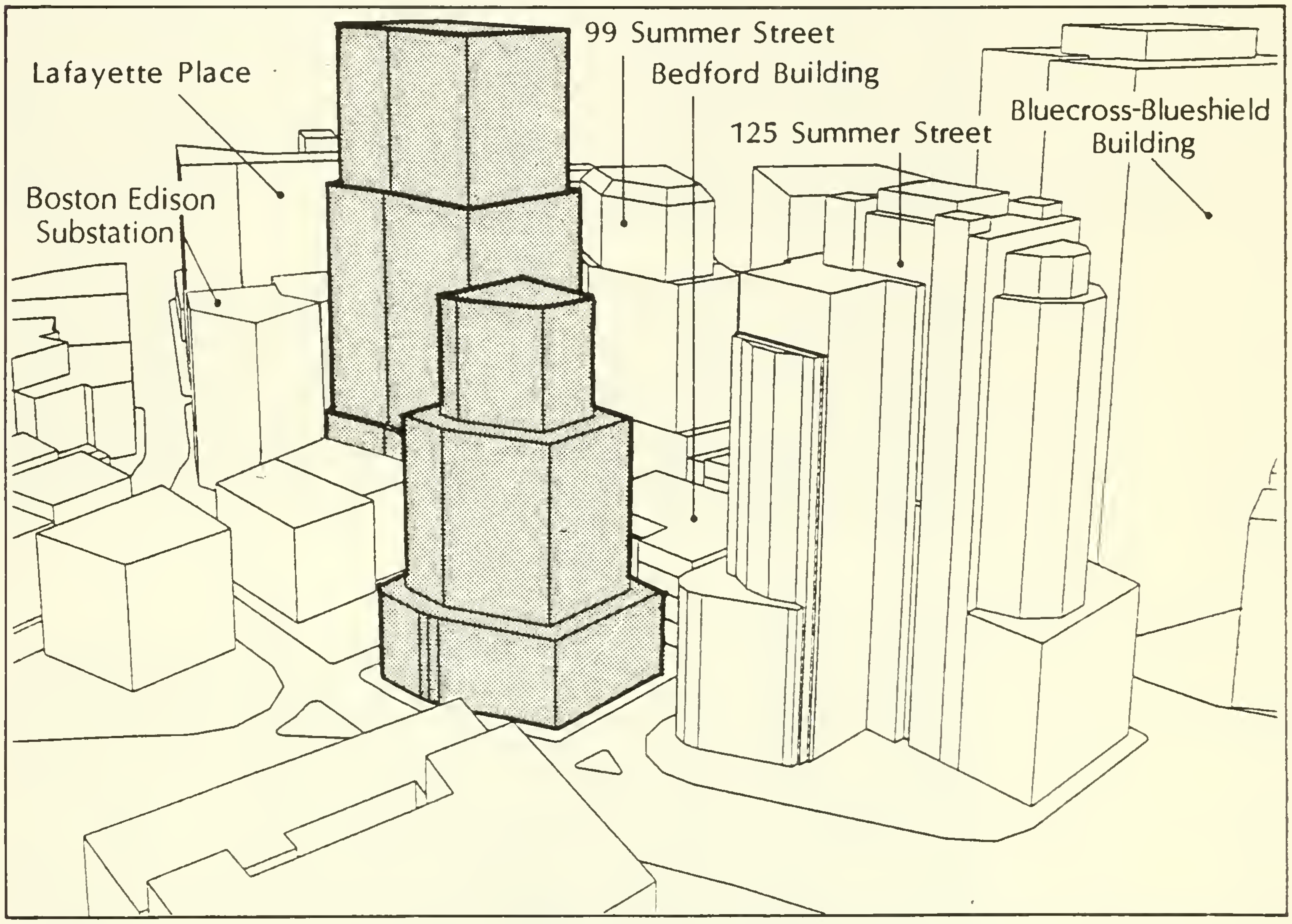


Figure IV E-13:
Perspectives Alternative 2

in Figure IV E-13. In essence, the proposed building exhibits scale and mass characteristics that reinforce its relationship to the Financial District.

The Essex Street block building proposed by Alternative 2 is 250 feet in height and has a 16,000 sq.ft. floorplate at the ground level. This building provides a degree of transition from 125 Summer Street (325 ft. in height) toward Chinatown and is slightly shorter than 99 Summer Street (280 feet in height). However, the building proposed for this site is 175 feet or more taller than the Bedford Building and the other five- to six-story buildings which are located across Columbia Street and Essex Street. The massing of the building exhibits a significant reduction in floorplate between the base, the shaft and the top. This has resulted in a structure whose massing provides a degree of transition in relationship to the surrounding structures.

325-ft. Tower (see Figure IV E-14)

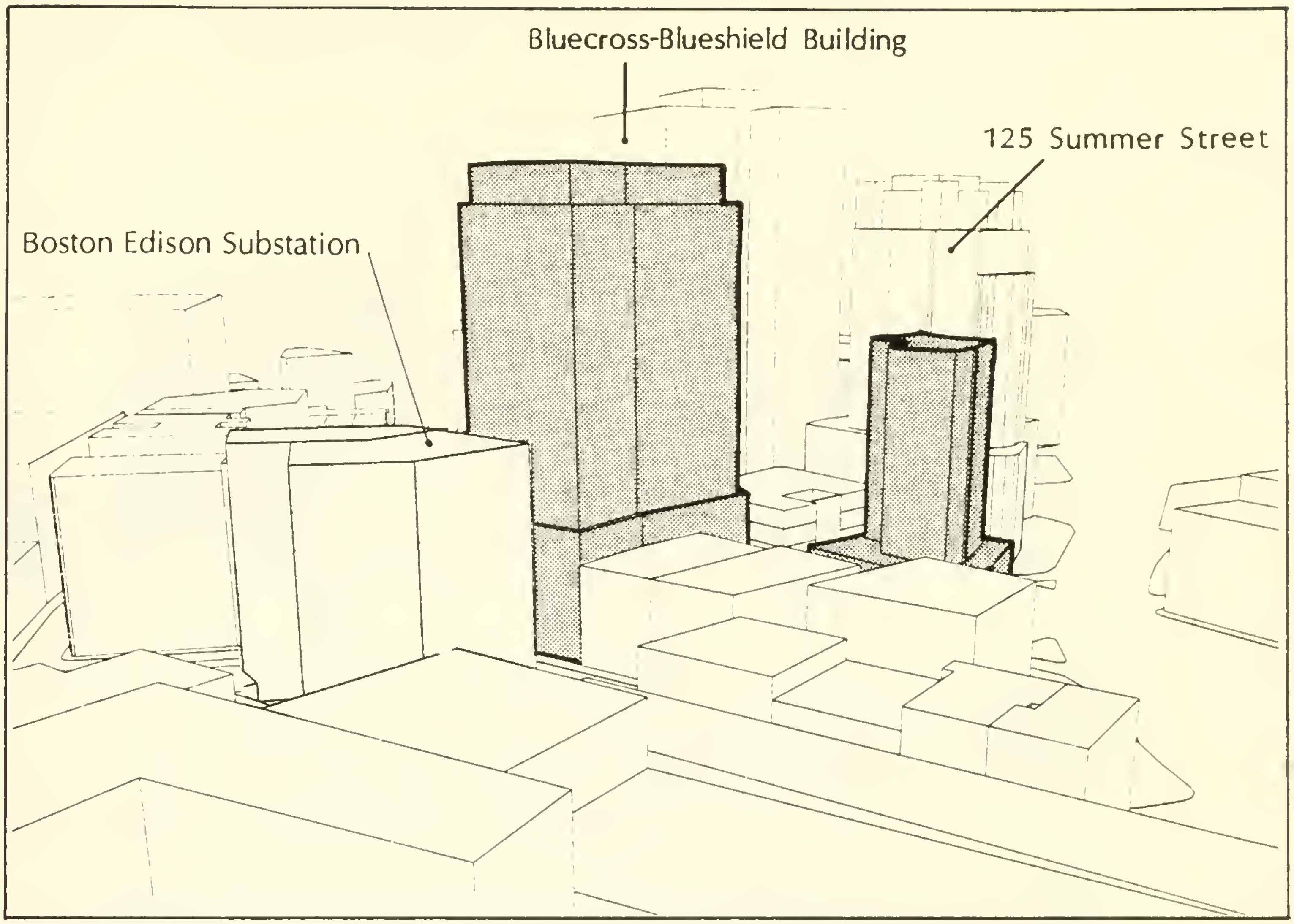
Alternative 3 proposes a 325-foot tall building on the Kingston-Bedford Street block with a 21,000 sq.ft. floorplate at the ground level. The height of this structure is similar to that of 125 Summer Street and only marginally exceeds the height of the Lafayette Hotel and 99 Summer Street. This is shown by the site sections in Figure IV E-9. The mass and bulk characteristics of the building are in excess of those typified by adjacent buildings across Kingston Street and Essex Street. This is caused in part by setbacks from the building base to the shaft that are insufficient to affect the overall massing of the structure. Figure IV E-14, aerial perspectives from Chinatown and across the Surface Artery, demonstrates these height and massing relationships. The Kingston-Bedford Street block building in Alternative 3, although smaller than Alternative 2, also would reinforce the scale and massing found within the Financial District.

The Essex Street block building proposed by Alternative 3 is 200 feet in height, with a 16,000 sq.ft. floorplate. Since this alternative is significantly shorter than 125 Summer Street and 99 Summer Street, it provides a degree of transition toward Chinatown in terms of height, although it is more than 100 feet taller than the Bedford Building. A significant reduction in floorplate from the base to the shaft of the building is evident and contributes to a reduction in the perceived mass of the building. This has resulted in a structure whose massing provides a noticeable transition from the relatively tall Financial District office towers to structures typical of Chinatown.

250-ft. Tower (see Figure IV E-15)

Alternative 4 proposes a 250-foot tall building on the Kingston-Bedford Street block with a 21,000 sq.ft. floorplate. At this height, both 99 Summer Street and 125 Summer Street are marginally taller. This relationship is illustrated by the site sections provided in Figure IV E-10. In terms of mass and bulk, the building presents a relatively massive appearance compared to surrounding structures within Chinatown, caused, in part, by a setback from the building base to the shaft which appears insufficient to affect the overall massing. In contrast, the building's mass is similar to that exhibited by office towers to the north and northeast in the Financial District. In summary, this building is more closely related in its overall mass to the Financial District, whereas the height of the building appears to provide a transition in scale between the Financial District and Chinatown.

View from
Chinatown



View from
Leather District

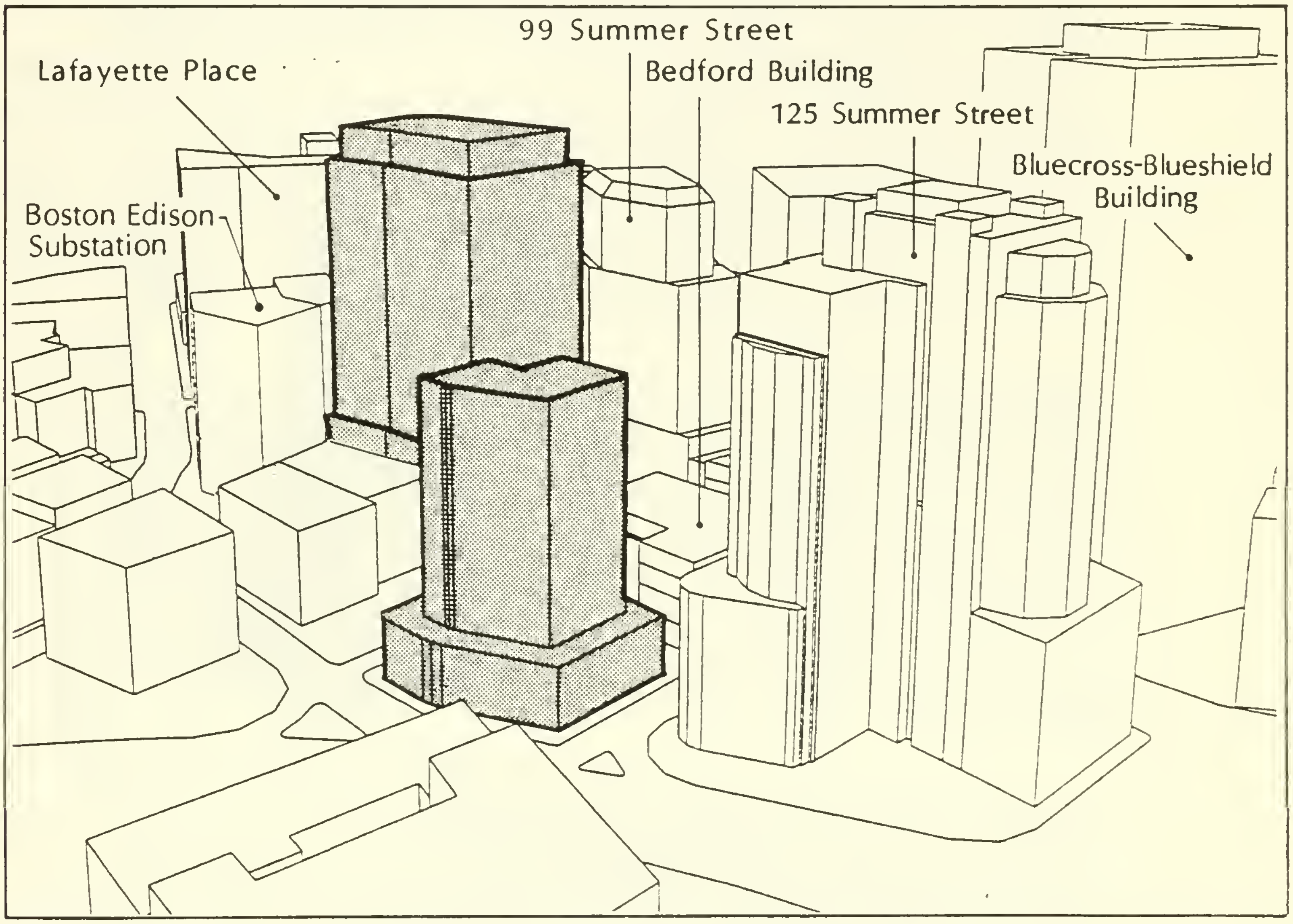
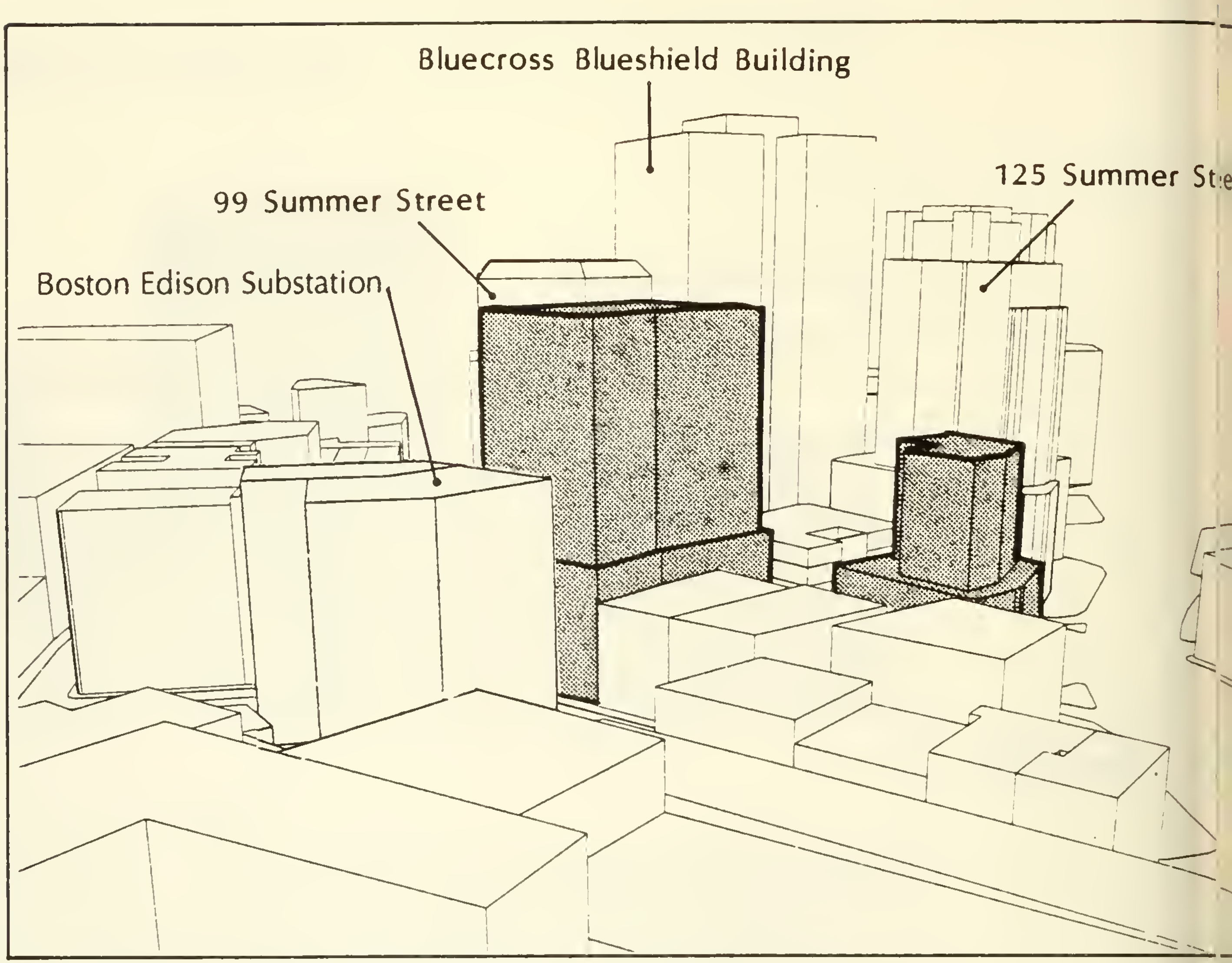


Figure IV E-14:
Perspectives Alternative 3

View from Chinatown



View from Leather District

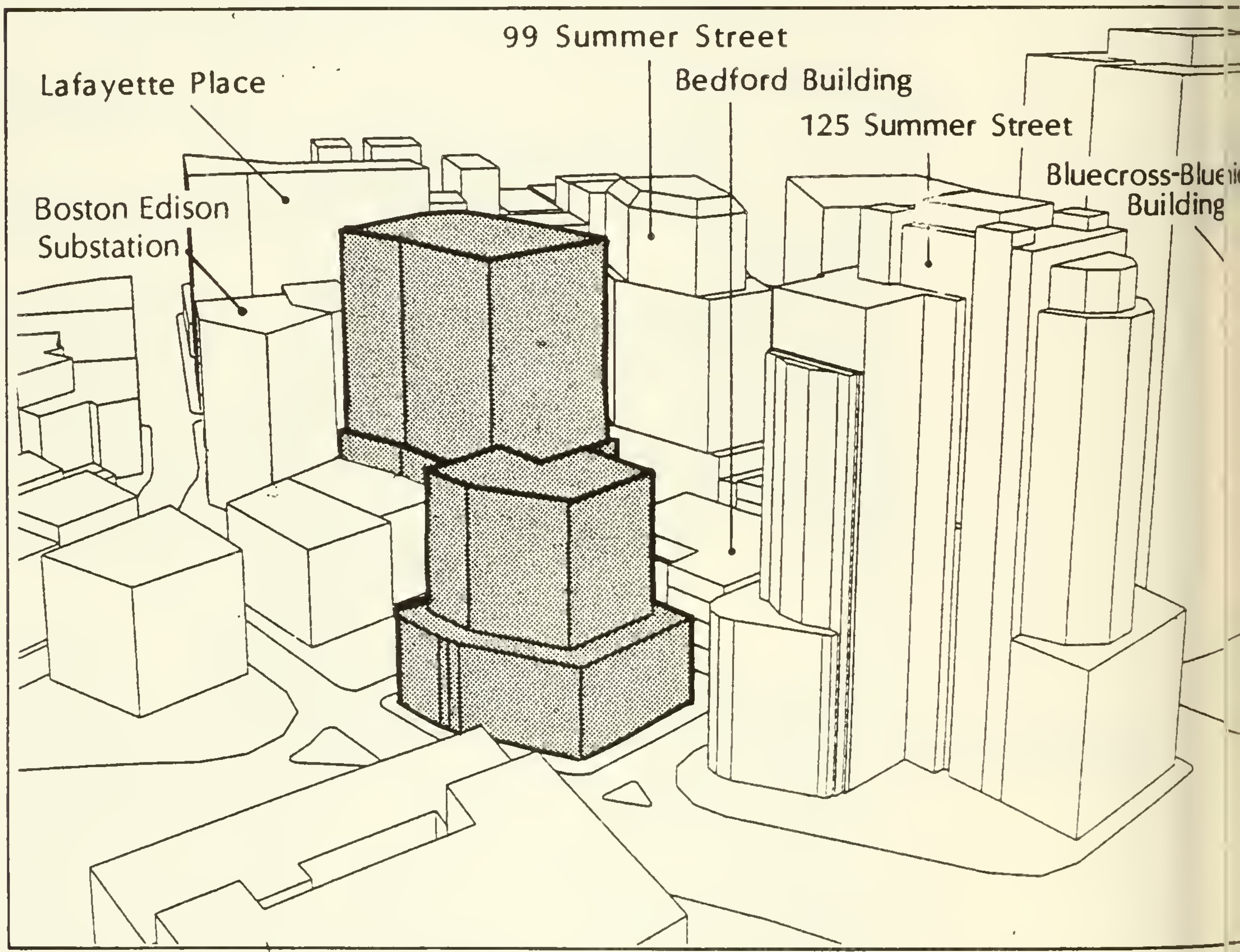


Figure IV E-15:
Perspectives Alternative 4

The Essex Street block building proposed by this alternative is 150 feet in height with a 16,000 sq.ft. floorplate. This building provides a substantial transition in height from 125 Summer Street to the five- to six-story buildings typical of Chinatown. The height relationships are shown in Figure IV E-15. In terms of mass, the building exhibits a substantial setback from the building base to the shaft. This establishes mass and bulk characteristics which reinforce those of the five- to six-story structures in Chinatown. However, this massing is considerably less than that exhibited by the adjacent office buildings, such as 99 Summer Street and 125 Summer Street, and the Financial District.

Expanded Site (see Figure IV E-16)

Alternative 5, unlike Alternatives 2 through 4, assumes the widening of Essex Street and the removal of the two existing brick structures adjacent and to the south of the Kingston-Bedford garage. Columbia Street is closed to traffic in this alternative and becomes a pedestrian way entering into a plaza area. These changes expand the site area found in Alternatives 2, 3 and 4.

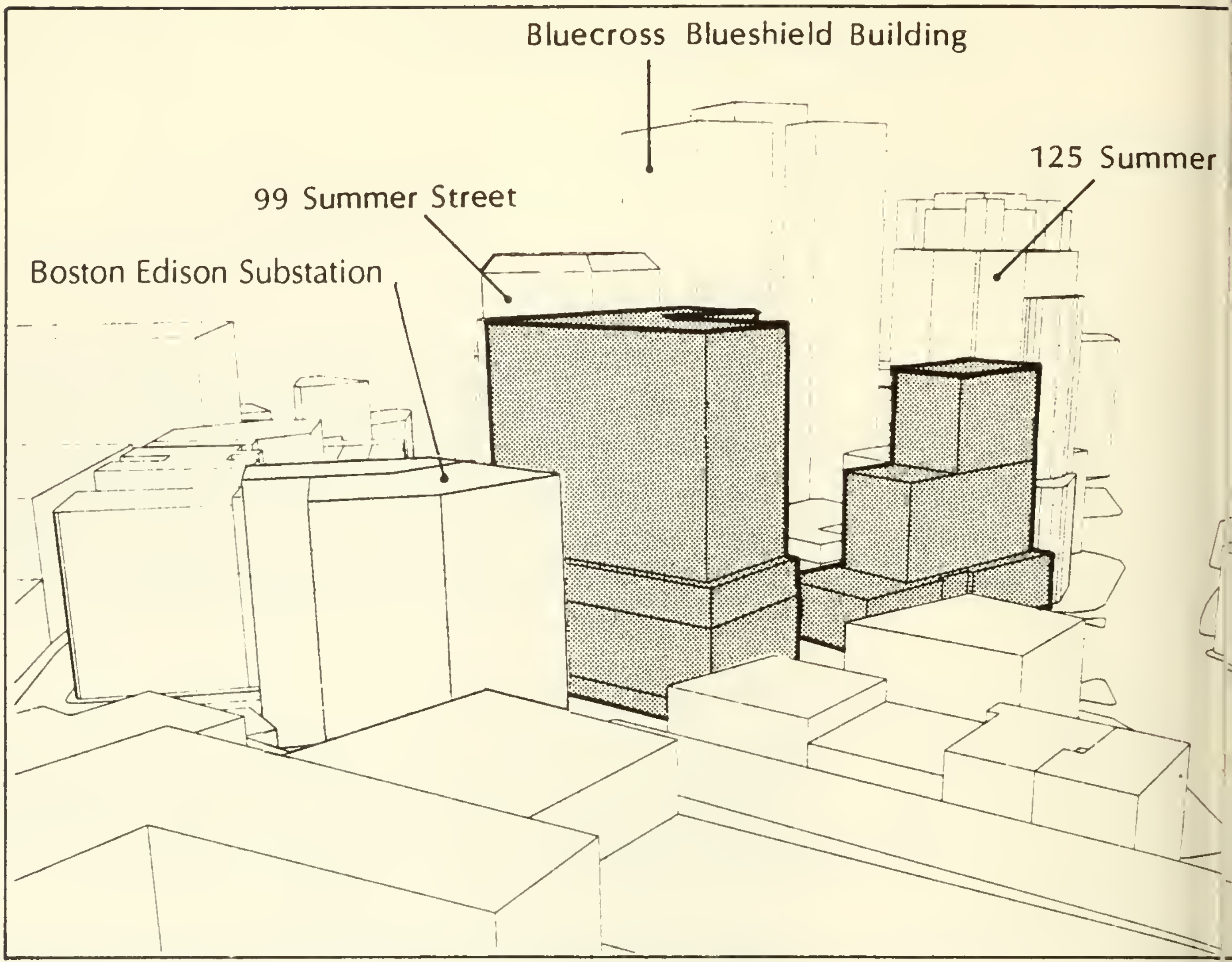
Alternative 5 proposes a building of 240 feet in height on the expanded Kingston-Bedford block site with a 30,000 sq.ft. ground level floorplate. The overall height of the structure is similar to that of Alternative 4 and provides a transition from 99 Summer Street and 125 Summer Street toward Chinatown, as shown in Figure IV E-11. The massing characteristics of the building indicate a modest setback from the building base to the shaft. However, the portion of the shaft of the building which extends along Kingston Street towards Essex Street introduces a relatively massive building element which is less successful in providing a transition in building mass to that found in Chinatown. The aerial perspectives in Figure IV E-16 illustrate this point. In summary, the overall height of this building provides a transition from the Financial District building heights to Chinatown, while the massing of the building reinforces the mass and bulk characteristics of the Financial District.

The Essex Street block building proposed by this alternative is 200 feet tall with a 17,200 sq.ft. floorplate at ground level. The building is the same in overall height as Alternative 3, and provides a similar transition from 125 Summer Street and 99 Summer Street towards Chinatown. The Bedford Building is about 100 feet lower in height. The site sections in Figure IV E-11 illustrate these points. The proposed building shaft steps back significantly from the base and away from the Kingston-Essex Street intersection, substantially reducing the overall mass and providing a transition from the taller buildings of the Financial District to those in Chinatown. The aerial perspectives in Figure IV E-16 illustrate this transition. In summary, the Essex Street block building proposed by Alternative 5 provides a transition in height and mass between the Financial District and Chinatown.

Developer's Proposal (see Figure IV E-17)

Alternative 6 is similar to Alternative 5 in that Essex Street is widened, the two existing brick structures on the Kingston-Bedford block are removed, and Columbia Street is closed to vehicular traffic. Its footprint, massing, and overall height are significantly different from Alternatives 2, 3, 4 and 5 since Alternative 6 has only a single tower set on a low-rise base. The tower, which has a total height of 514 feet, is taller than those found in the other alternatives. However, the redistribu-

View from Chinatown



View from Leather District

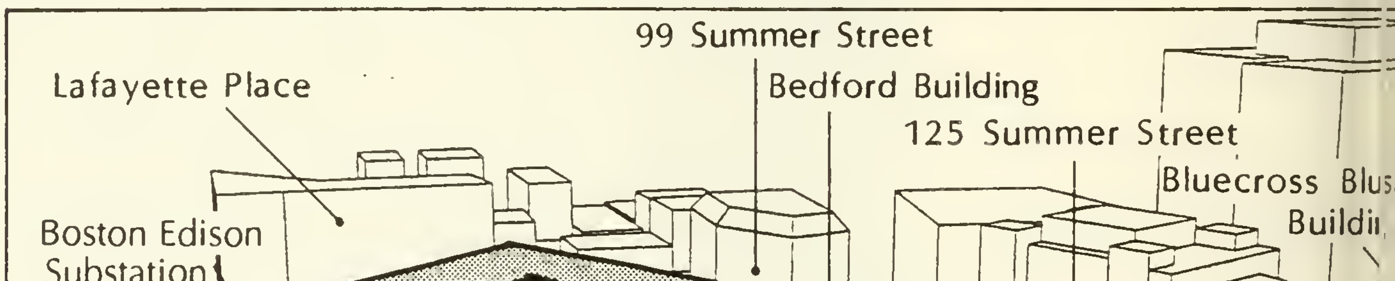
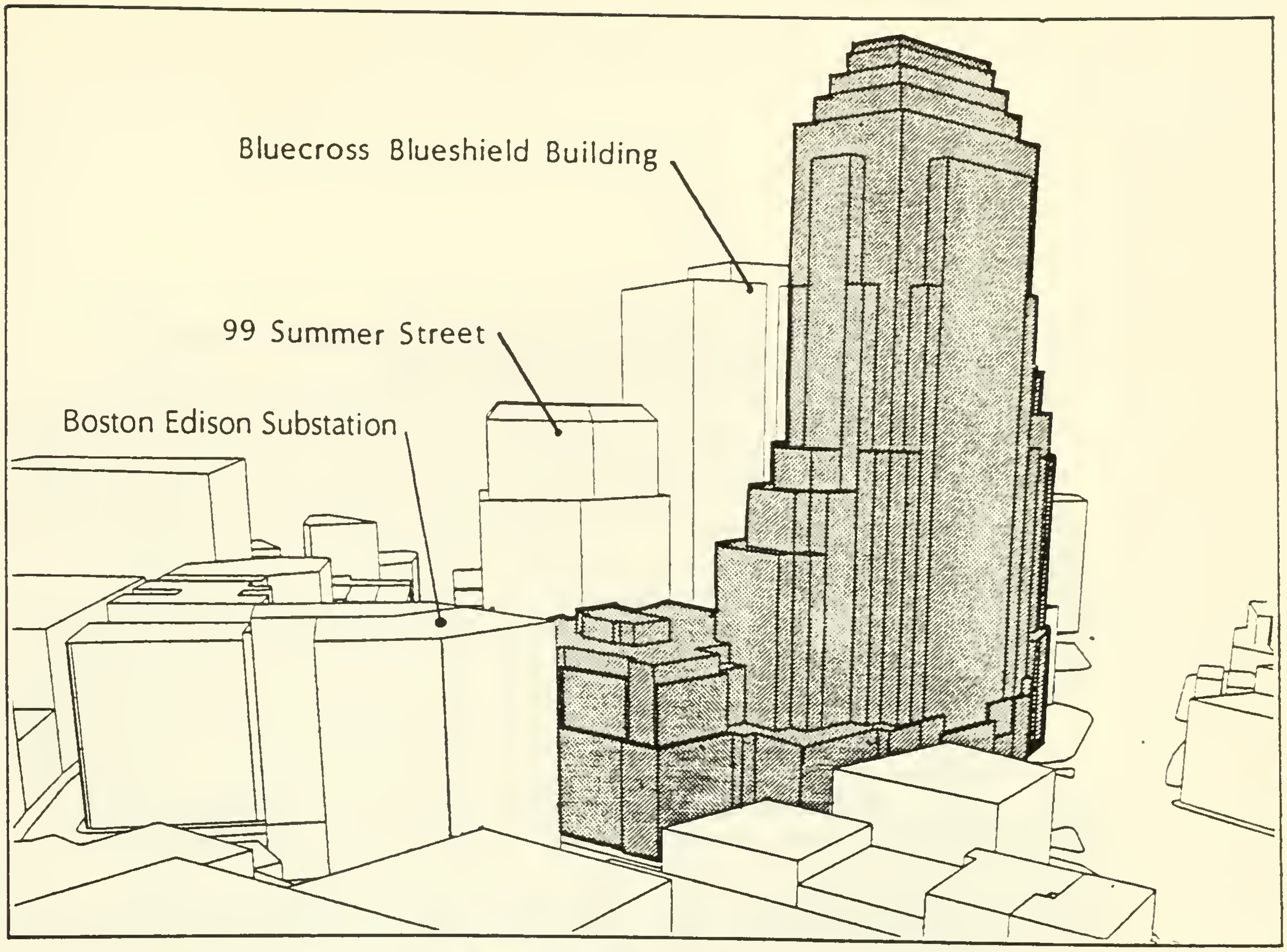


Figure IV E-16:
Perspectives Alternative 5

View from
Chinatown



View from
Leather District

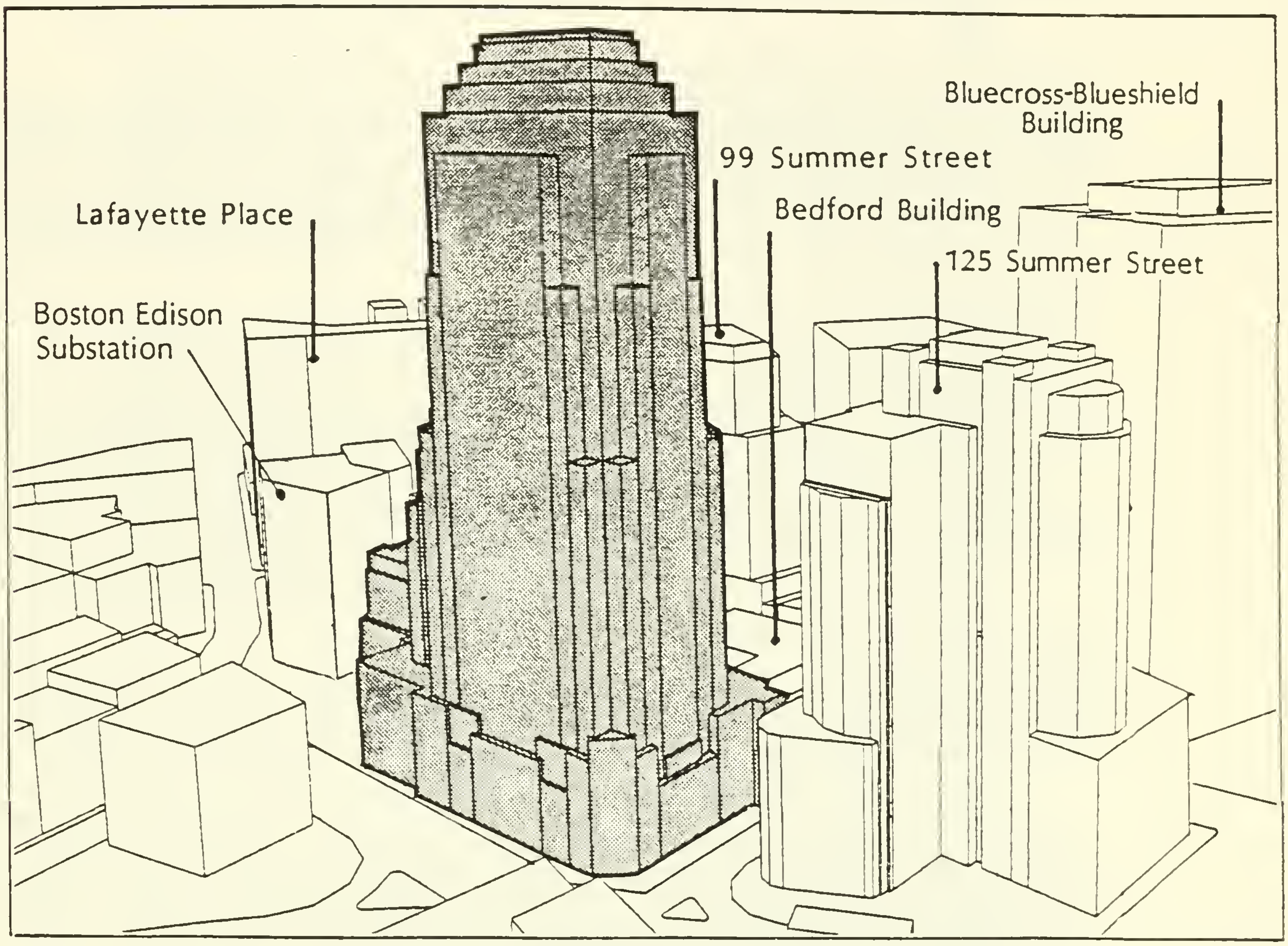


Figure IV E-17:
Perspectives Alternative 6

tion of massing from two towers to only one results in a low-rise base characteristic of the heights of older buildings in the area.

The floorplate of Alternative 6 at the ground level is 51,100 square feet. The portion of the building covering the Kingston-Bedford block is 124 feet high, with a five foot setback at 74 feet which reflects the cornice line of the Bedford Building. This overall height provides more of a transition to the existing Chinatown buildings than the towers proposed for this location by Alternatives 2 through 4.

Alternative 6 has a pedestrian passageway that extends from Bedford Street, along the former Columbia Street, to the single tower which is sited on the Essex Street block. The north face of the tower has a low arcade of 70 feet in height along its juncture with the Bedford Building. From the arcade, the building rises to 438 feet, then steps back in increments until reaching a total height of 514 feet. The south and east faces of the tower have some setbacks at the base but rise in essentially the same manner as the north face. Along Kingston Street, Alternative 6 has substantial stepbacks from the building base leading towards the tower which provides for a transition in height on the west side of the tower.

The aerial perspectives in Figure IV E-17 illustrate the relationship of Alternative 6 to adjacent buildings and show the tiered effect of massing of the tower on the Essex Street block and the lower buildings elements on the Kingston-Bedford block.

While Alternative 6 provides the lowest building on the Kingston-Bedford site, the tower on the Essex Street portion of the site exceeds the height of adjacent office towers and is the tallest of the alternatives being studied. The tower is approximately 160 feet taller than 125 Summer Street which is across Lincoln Street to the east. However, this alternative is shorter in height than One Financial Center which is across the Surface Artery to the southeast and the Federal Reserve Building both of which are 600 feet tall.

Street Level Comparisons

This section identifies and evaluates the impacts on the visual environment at street level. These impacts are conveyed through a series of eye-level perspectives taken from key vantage points around the site (see Figure IV E-7). Each view compares the existing conditions with the proposed build alternatives. The street level visual effects of the project are portrayed by a photomontage process. Photographs of the site were taken from key vantage points which represent high levels of pedestrian activity. These photographs were then superimposed with a computer-generated perspective view of each alternative as it would appear from that viewpoint.

View 1 was taken from the Surface Artery just south of the Essex Street intersection. This is the view automobile passengers would see traveling north on the artery. It shows the ground plane, roof treatment and open space areas on the southern side of the project, and part of the 125 Summer Street development. View 2 was taken from Essex Street to the west of the site. Pedestrians approaching the site from Chinatown and the Orange Line station at Washington Street would experience this viewpoint. It shows the southwestern portion of the project site. View 3 was taken from the Church Green looking west along Bedford Street to the project site. It shows the scale of historic buildings along Bedford Street and their relationship to the project site.

The design characteristics used to evaluate the street level visual impact of the proposed project include mass and scale, building setbacks, and view corridor/streetscape features.

Viewpoint 1 (Figures IV E-18 to IV E-20)

Viewpoint 1 is an eye-level view looking north across the Surface Artery towards the project site. The existing mechanical garage on the Kingston-Bedford Street block is clearly seen in the existing site photo with 99 Summer Street in the background and the rear of the Bedford Building on the right side of the photo (see Figure IV E-18). The building in the left foreground is the five-story brick mercantile building located at the Kingston-Essex Street intersection. Columbia Street is seen in the center of the photo.

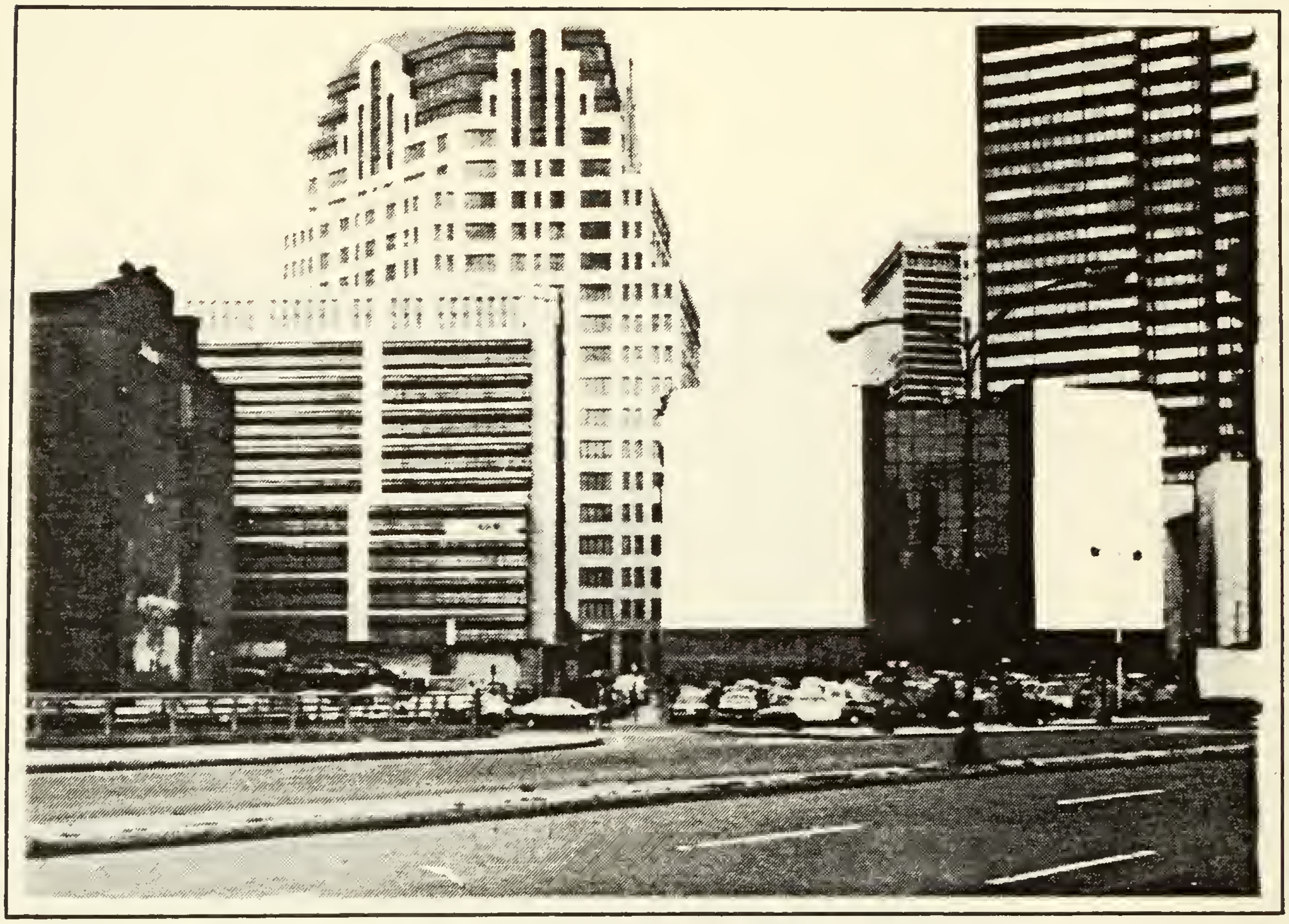
<u>400-ft. and 325-ft. Towers</u>. This viewpoint (Figures IV E-18 and IV E-19) demonstrates the substantial change in the street level view proposed by Alternatives 2 and 3, when compared to existing conditions. A substantial portion of 99 Summer Street is blocked from view, as is the view of other buildings in the skyline and the Bedford Building. The Kingston-Bedford Street block has an eight-story base in these alternatives, with the building shaft rising out of the cone of vision, as shown from this viewpoint.

The building base is slightly taller and more massive than the five- to six-story adjacent structures. The shaft is set back from the building base, which partially reduces the overall mass and height impact from this street level view. This building has been sited to provide a greater setback along Columbia Street than currently is provided by the mechanical garage. The positive result of this has been to create more open space along the streetscape for public use and to enhance the view corridor along Columbia Street.

The Essex Street block building proposed by Alternatives 2 and 3 is shown in the right foreground of Figures IV E-18 and IV E-19. It presents a five-story base which is set back from the street at the sidewalk line. The shaft of the building in these alternatives rises above the cone of vision but is stepped back from the building base away from Essex Street and Columbia Street. The base presents a height and mass consistent with that of structures along Essex Street. In addition, the proposed building wall at the sidewalk line is also consistent with the Essex Street streetscape. From this viewpoint, the Essex Street block building substantially alters the existing view corridor along Columbia Street, as its use is converted from surface parking.

<u>250-ft. Tower</u>. This alternative (Figure IV E-19) presents a change in view similar to that of Alternatives 2 and 3. The Kingston-Bedford block building has the same form, but the Essex Street block building has a slightly taller base and an additional tier to the shaft. This form allows a certain amount of reduction to the mass of the building shaft. In other respects, it is essentially the same as Alternatives 2 and 3.

<u>Expanded Site</u>. This alternative presents a significant change in the street level view (see Figure IV E-20). The Kingston-Bedford Street block building extends to Essex Street with a five-story base and a shaft which steps back from the base along Essex Street to a point above the cone of vision from this vantage point. The building wall is angled away from Essex Street to provide additional public



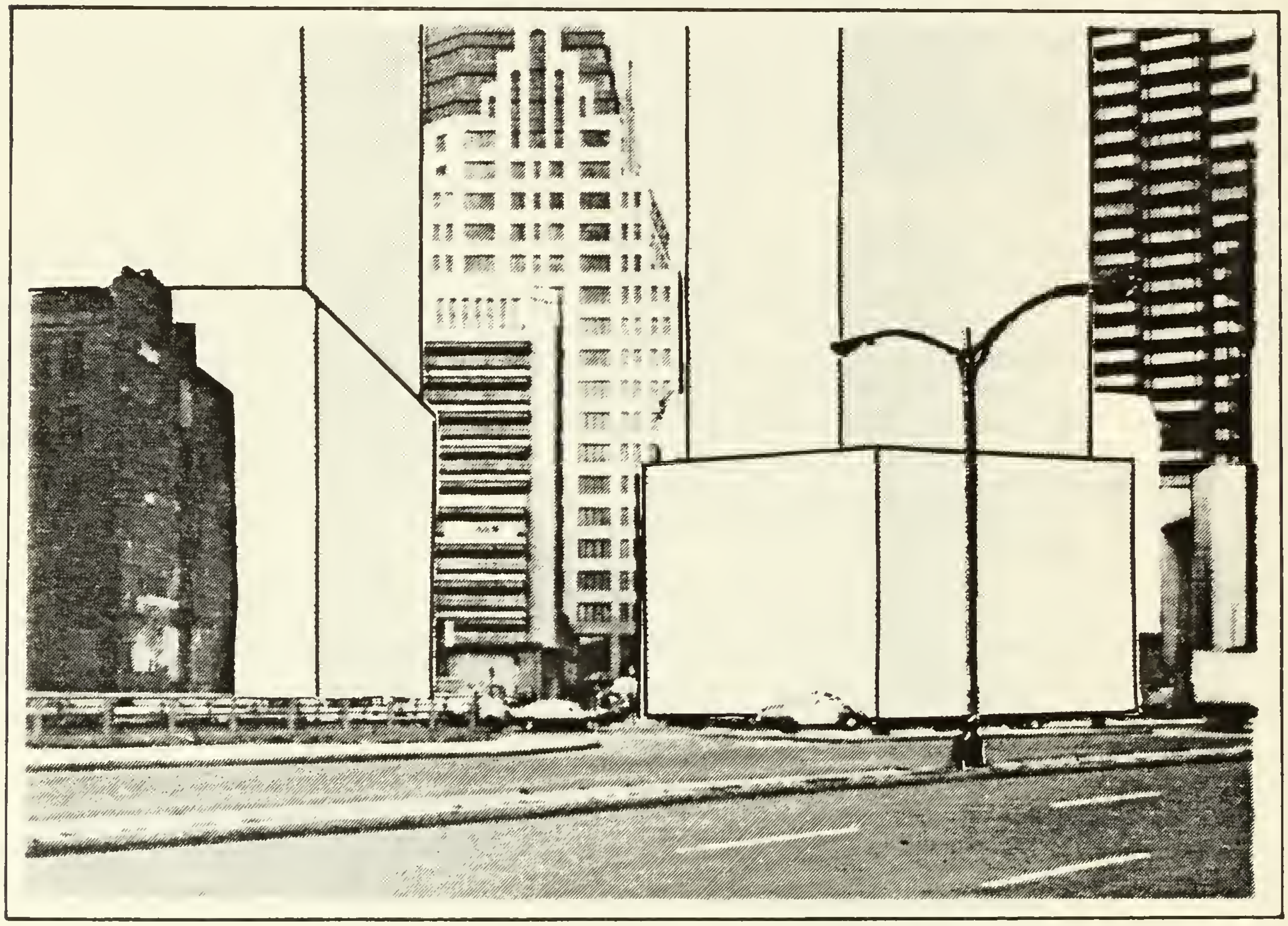


Figure IV E-18:
Viewpoint 1 Alternatives 1 & 2

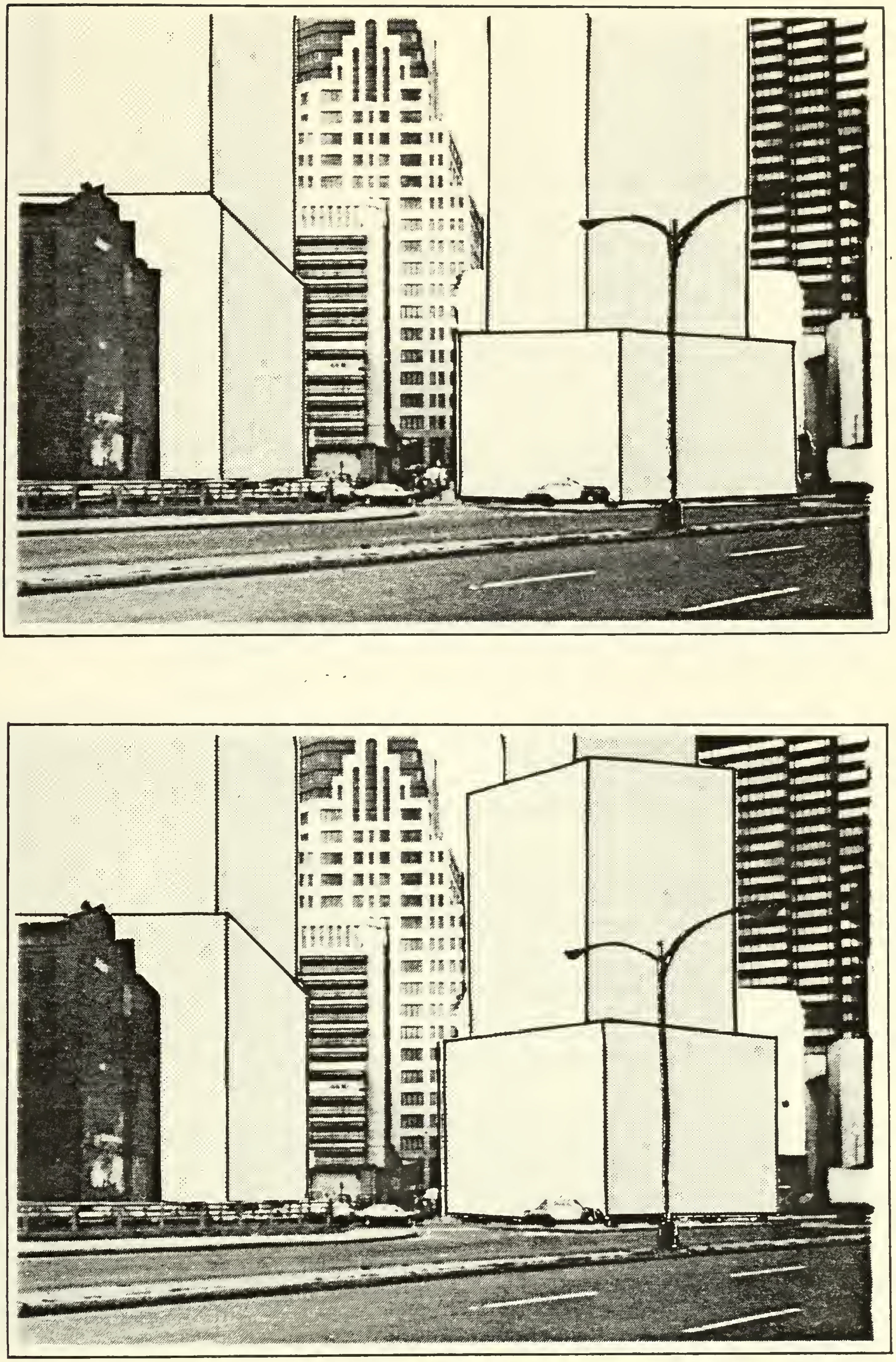
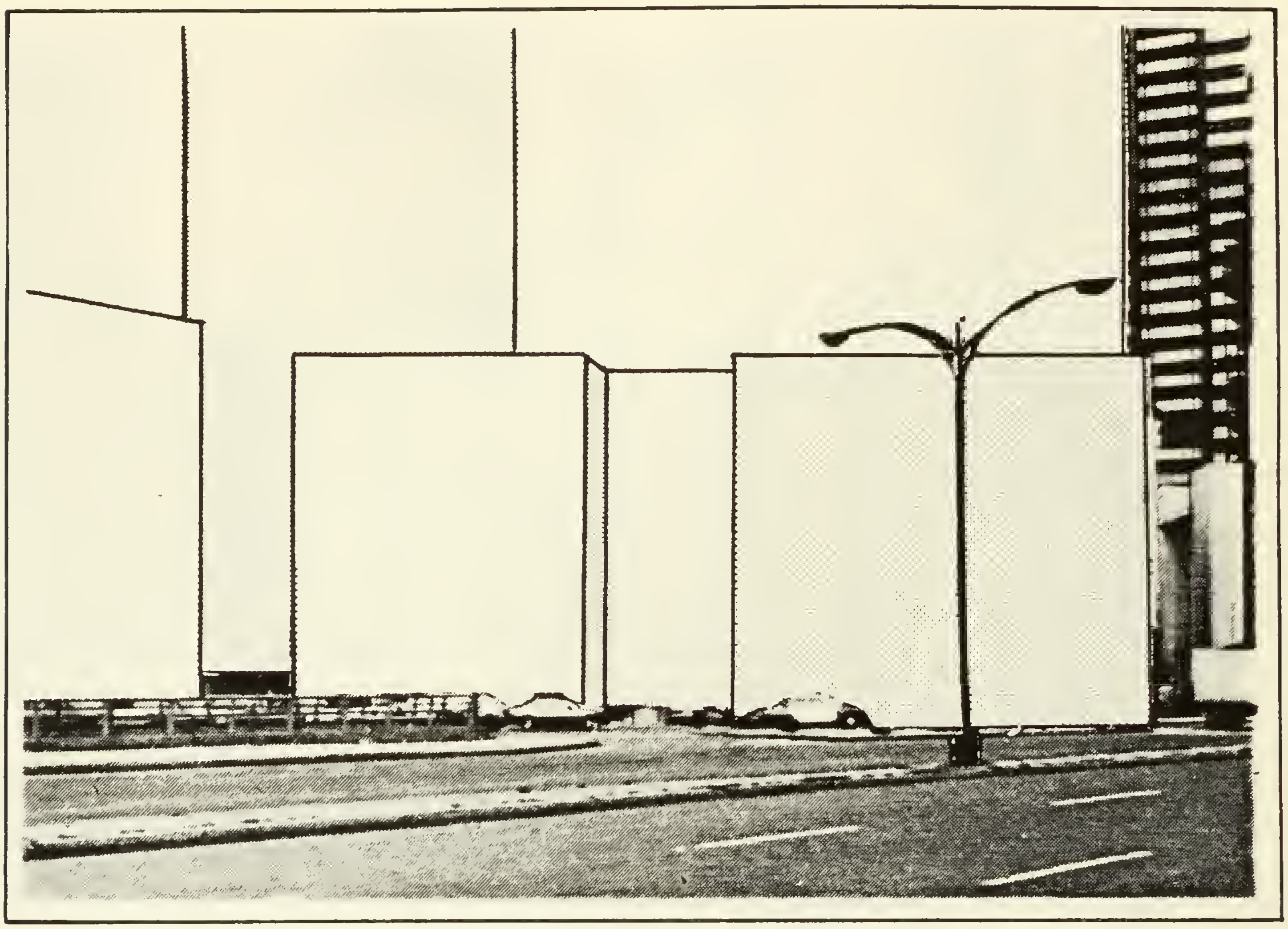


Figure IV E-19:
Viewpoint 1 Alternatives 3 & 4



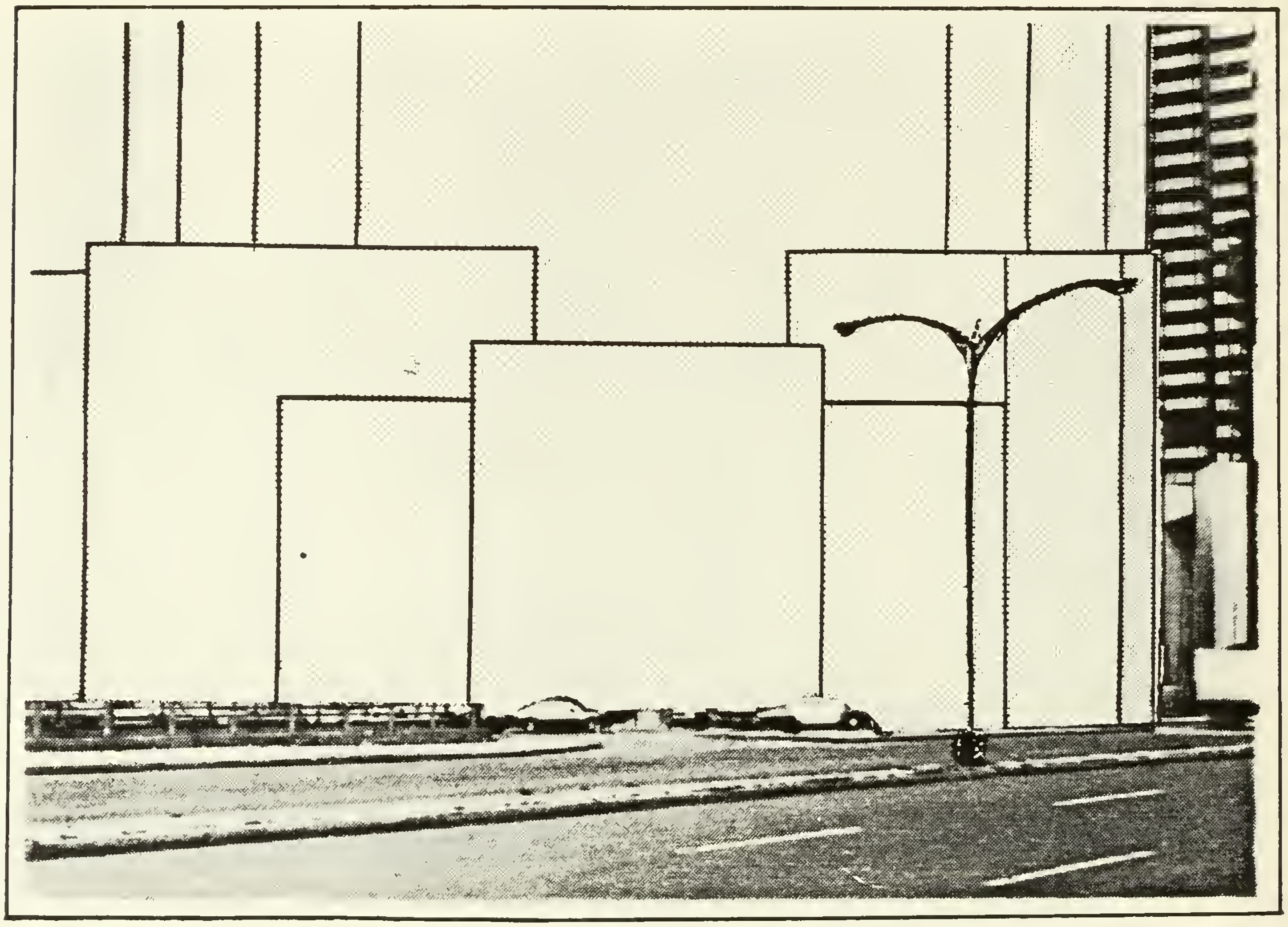


Figure IV E-20:
Viewpoint 1 Alternatives 5 & 6

open space along Essex Street. This acts as an entry zone to the project site from Chinatown.

The Essex Street block building under Alternative 5 has an expanded footprint along Essex Street, as is evident in the right foreground of Figure IV E-20. This substantially changes the existing Columbia Street view corridor condition. From this vantage point, the building partially obscures the open space corridor provided through the project. The building exhibits a five-story base set at the sidewalk line with a substantial step back of the shaft away from the Kingston-Bedford Street block building. The shaft rises above the cone of vision from this viewpoint.

From this street level viewpoint, Alternative 5 presents potential impacts with respect to the massing of the Kingston-Bedford Street block building at Essex Street. Although partially alleviated by the stepback of the shaft, it is still evident that the overall massing at this point is substantially greater than that of the surrounding structures. The Essex Street block building provides a stepback from the base which scales down its mass to a level compatible with adjacent buildings.

Developer's Proposal (see Figure IV E-20) creates a significant change from this viewpoint, somewhat similar to Alternative 5. Almost all of the street edge along Essex Street is in line with the base of the tower. The base varies in height from 48 to 76 feet, with three to five foot setbacks to the shaft which rises out of the cone of vision.

Alternative 6 obscures some of the buildings behind it from this view. The length of the uninterrupted street wall along Essex Street created by Alternative 6 from this viewpoint introduces a mass and scale at the street level which is inconsistent with that found in Chinatown and with adjacent office structures.

Viewpoint 2 (Figures IV E-21 to IV E-23)

Viewpoint 2 is an eye-level view along Essex Street looking east. Orientation to the project site from this viewpoint is provided by the five-story brick mercantile building at the corner of Essex and Kingston Streets as shown by the photo in Figure IV E-21. This building is at a compatible scale to the buildings in Chinatown south of the site, evident in the foreground of the photo. Seen in the background are the Federal Reserve Bank Building and One Financial Center. It should be noted that the 125 Summer Street project will be visible under existing conditions from this viewpoint, just to the left of the Federal Reserve Bank Building, once construction is completed.

Alternatives 2, 3 and 4. From this viewpoint, the streetscape will remain quite similar to that of the existing conditions. However, upper portions of the Essex Street block building will be clearly evident as it rises behind the five-story mercantile structures at the corner of Kingston and Essex Streets. Alternative 2 (Figure IV E-21) presents the building of greatest height of these three alternatives. Consequently, it has the most visual impact. However, the streetview of the height of the tower mass does provide a transition from the height and scale of the Financial District office buildings. Alternative 3 is lower, yet still blocks the view of buildings behind it (Figure IV E-22). As the alternative with the lowest height on that block, Alternative 4 is more in scale with the existing mercantile buildings (Figure IV E-22).

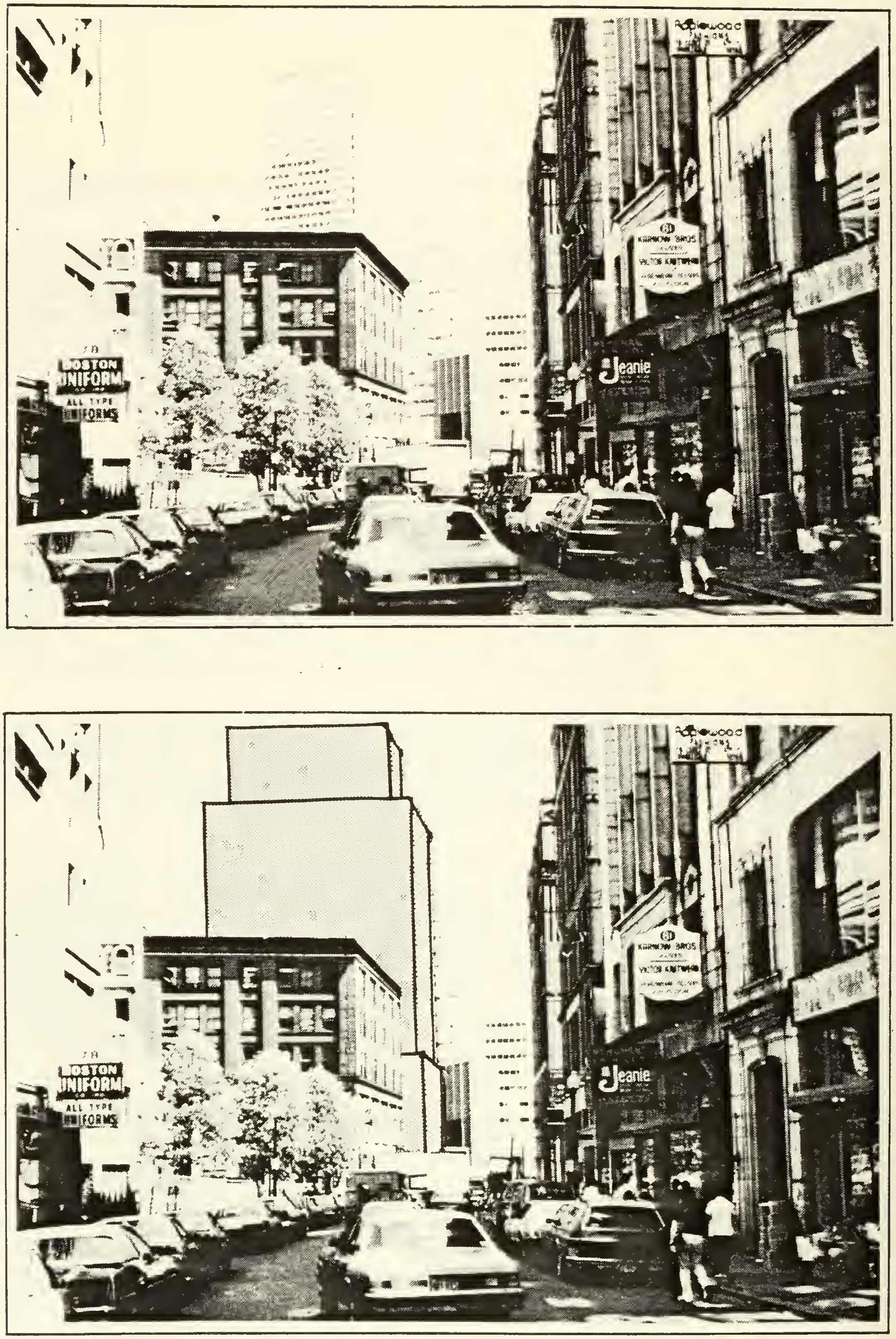
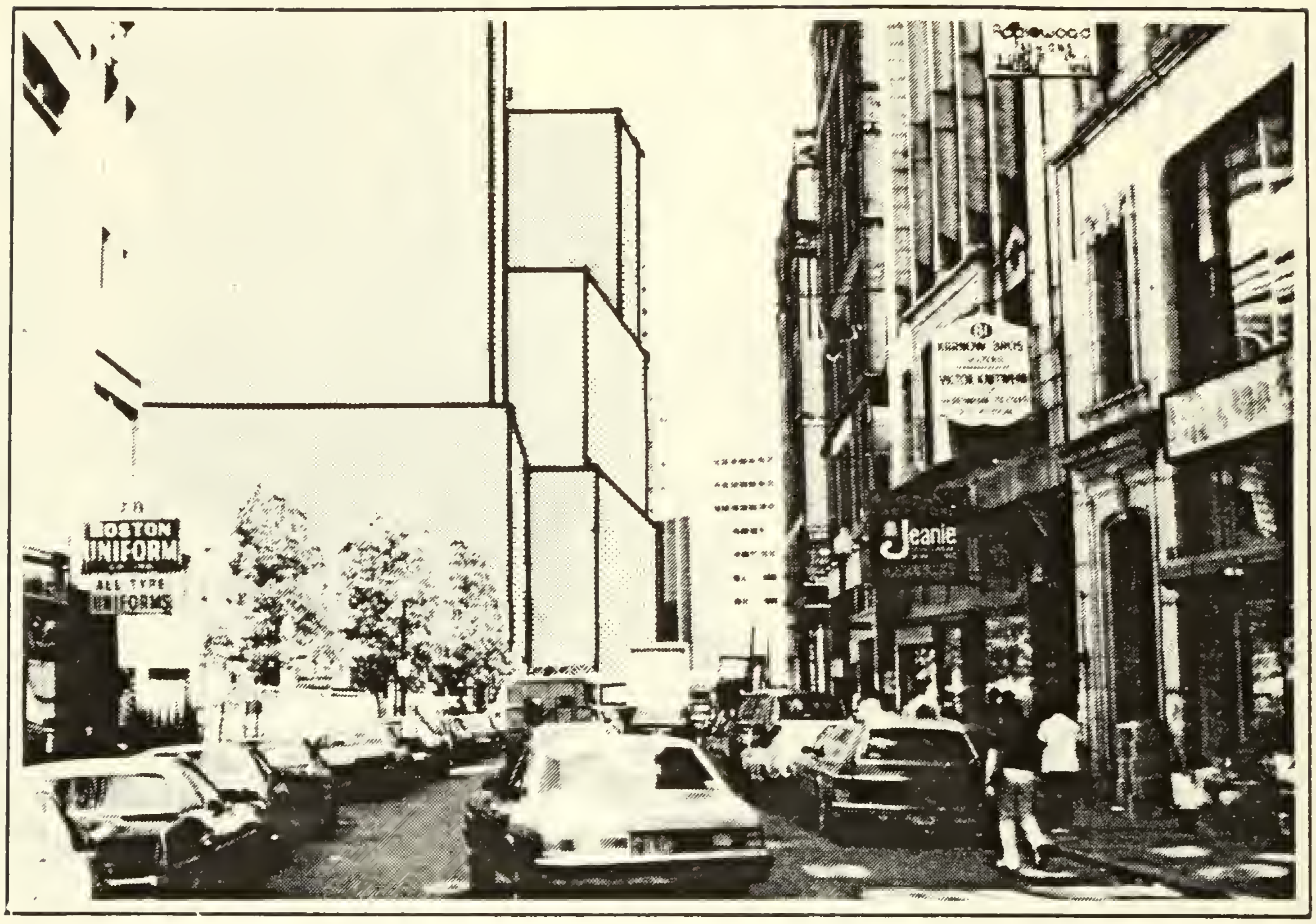


Figure IV E-21:
Viewpoint 2 Alternatives 1 & 2

Figure IV E-22:
Viewpoint 2 Alternatives 3 & 4



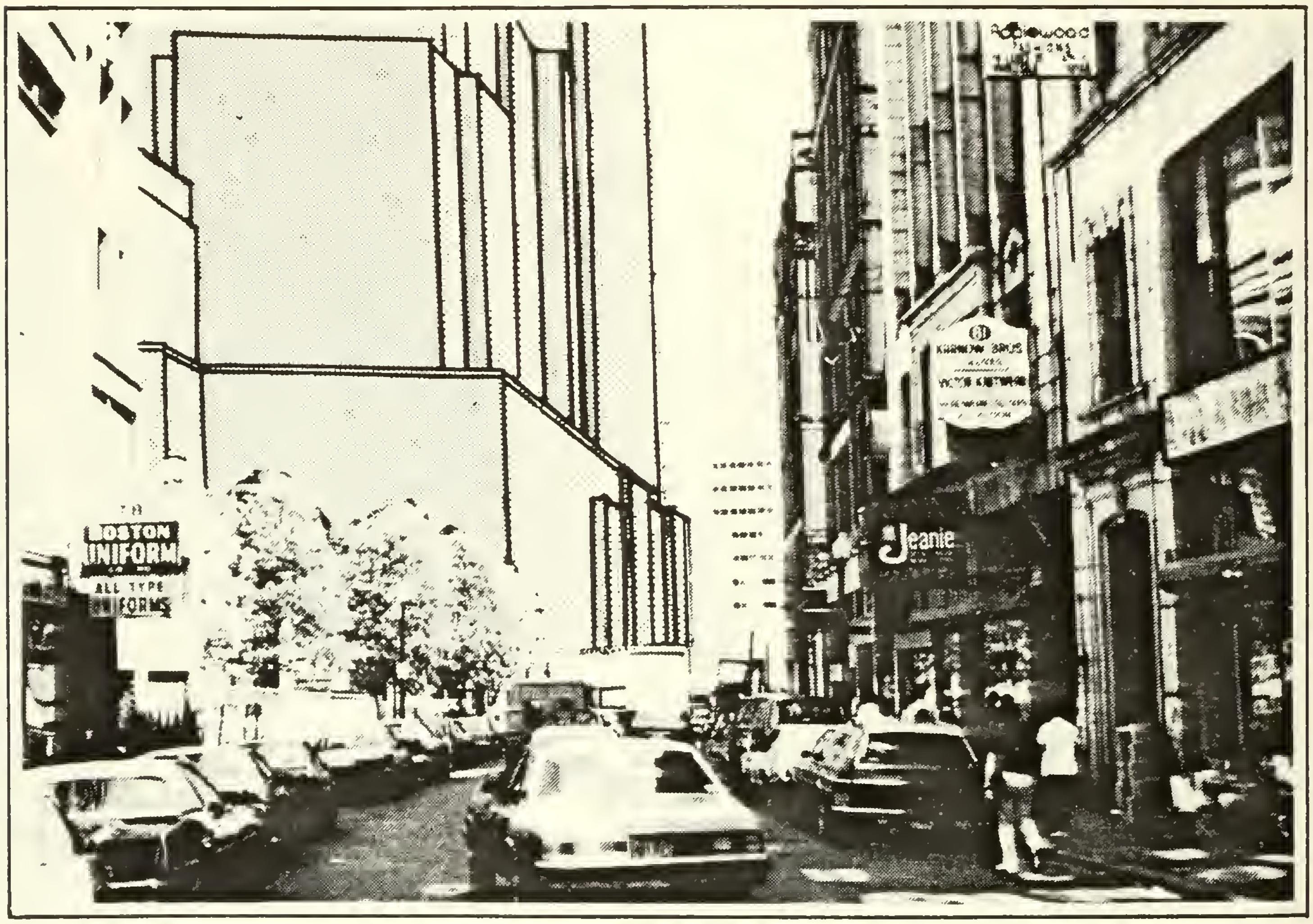


Figure IV E-23:
Viewpoint 2 Alternatives 5 & 6

The Kingston-Bedford Street block building proposed by these alternatives is not visible from this vantage point (Figures E-21 and IV E-22). Both Alternatives 3 and 4 (Figure IV E-22) appear to function well as transitional massing elements from this viewpoint. Potential impacts associated with building setbacks and view corridor changes caused by these alternatives are not evident from this viewpoint.

Expanded Site. This alternative presents a significant change in the streetscape from this viewpoint (see Figure IV E-23). Removal of the five-story mercantile structures as a result of the Essex Street widening at Kingston Street and Essex Street is evident. They are replaced by a building that extends along Kingston Street with a five-story base that then steps back and rises out of the cone of vision. While presenting more height and mass in the viewpoint foreground, this alternative also provides additional building setback along Essex Street. In concert with the building setback from its base, this offsets, to a degree, the impacts of the overall increased height and mass introduced at this corner by Alternative 5. The additional setback also enhances the view corridor and provides additional public open space along Essex Street.

This alternative also proposes a building along the Essex Street block. The five-story base of the building is consistent with other foreground buildings along Essex Street by providing a building wall at the sidewalk line. The shaft of the building is stepped back from its base away from Essex Street and the Kingston-Essex Street intersection. This partially offsets the overall impacts of height and mass of the building which is greater than that of buildings located on the south side of Essex Street. The view corridor from this perspective is essentially maintained.

Developer's Proposal. This alternative proposes a significant change from the existing streetscape along Essex Street. The 74-foot building base relates to the height of surrounding mercantile buildings and is an improvement over the other alternatives in that respect However, this alternative has an uninterrupted street wall along Essex Street, as shown from this viewpoint (Figure IV E-23). The building steps back at the mid-levels away from Kingston Street toward the tower on the Essex Street block. This provides the transitional elements of the building as they relate to the surrounding urban fabric. However, the tower portion and building base along Essex Street of Alternative 6 present a greater overall mass than the other alternatives.

The pedestrian open space provided by this alternative at the corner of Kingston Street and Essex Street is obscured by the existing trees from this vantage point.

Viewpoint 3 (Figures IV E-24 and IV E-25)

Viewpoint 3 is an eye level view looking west along Bedford Street from the Church Green Square just to the east of the project site. The existing view is documented by the photo in Figure IV E-24, where the Bedford Building is in the left foreground and the Church Green Building in the right foreground. The Kingston-Bedford Street garage is seen further down Bedford Street on the left, while 99 Summer Street is seen on the right. In the background, the Boston Edison substation (under construction) is visible and rises beyond the cone of vision. Further distant are the back side of Lafayette Place and a twelve-story mercantile building at Chauncy Street.

Figure IV E-24:
Viewpoint 3 Alternatives 1, 2, 3, & 4

Figure IV E-25:
Viewpoint 3 Alternatives 5 & 6

Alternatives 2, 3 and 4. From this vantage point, only the Kingston-Bedford Street block building is visible (see Figure IV E-24). The base is topped by a shaft which is stepped back from the base and rises above the cone of vision. Although taller in overall height than the adjacent Bedford Building, the base provides a transition in scale that is relatively compatible with surrounding structures and the overall streetscape. From this viewpoint, the shaft of the building in all these alternatives rises above the cone of vision, but under the existing conditions the same characteristic is effected by the nine-story mechanical parking garage. The net change, then, is minimal. The building is set at the sidewalk line, consistent with the other structures along Bedford Street and maintains the essential view corridor. In summary, the potential impacts of Alternatives 2, 3 and 4 from this viewpoint are limited to the overall mass of the building which is partially mitigated by the proposed stepback of the shaft of the building from its base.

Expanded Site. This alternative is quite similar to Alternatives 2, 3 and 4 from viewpoint 3 (see Figure E-25). However, Alternative 5 has a five-story base for the Kingston-Bedford Street block building, in contrast to the eight-story base for Alternatives 2, 3 and 4, and a more substantial stepback to the shaft from the base. These features deal more successfully with the overall mass and height of the building and result in more compatible massing with adjacent structures along Bedford Street.

Developer's Proposal. Alternative 6 is similar to the previous alternatives from this vantage point (see Figure IV E-25). It is more successful at transitioning than Alternatives 2, 3 and 4 because of the articulation of the facade and the stepback from base to shaft at the cornice line of the Bedford Building.

Shadows

This section evaluates the shadow impacts of the proposed alternatives. The shadows produced by the build alternatives are considered in conjunction with shadows produced by the existing structures in the area. Shadow diagrams are included in Figures IV F-26 to IV F-70.

Bedford Street

Alternatives 2 through 6 add net new shadow to Bedford Street to varying degrees, primarily during the summer months. During the mornings and afternoons, Alternative 2 has the most impact and Alternative 6 the least impact. The portions of Bedford Street to the east and west of the existing garage receive significant amounts of net new shadow during these hours.

At noontime during the summer, all the alternatives have net shadow impacts, with Alternative 6 having the most impact. During morning hours in the spring and the fall, a significant portion of Bedford Street near the intersection of Chauncy Street is shadowed by all the alternatives. During December, shadow impacts are limited to Alternatives 5 and 6 at noontime. Otherwise, no new shadows are created.

Columbia Street

The southern half of Columbia Street is shaded by Alternatives 2 through 4 during the morning from March through September. This portion of the street is replaced by buildings in Alternatives 5 and 6. However, the plaza space created between the two proposed buildings in Alternative 5 is shaded at these times also.

Alternative 6 closes Columbia Street and includes half the area of the street within the building, leaving the remainder as an outdoor pedestrian way to Bedford Street. This environment will be in shadow all day throughout the year. While it is currently in shadow from the existing garage and the Bedford Building in the afternoon and mornings, the proposed building is sited on its south side and results in shadows there at noon time as well.

Lincoln Street

The impacts on Lincoln Street will be the same for all the alternatives. The southern half of Lincoln Street will have new shadow impacts during the afternoon all year. The northern half is currently shaded by the Bedford Building. It will remain sunny at noontime.

Summer Street

None of the alternatives create net new shadow impacts on Summer Street.

Church Green

Church Green is affected by all the alternatives in the spring and the fall in the afternoon. Alternatives 2 through 5 block a portion of the sunlight that currently falls on this pedestrian area. Alternative 6 has the most net impact, shading all of Church Green at these times.

During summer, Alternative 2 shades most of the remaining sun in the afternoon, and Alternative 3 shades a smaller amount. During the winter, Church Green is already fully in shadow in the afternoon from the existing buildings.

Dewey Square

Dewey Square is unaffected by any of the alternatives because it is located southeast of the project site and shadows are not cast by the project to that area.

Downtown Crossing

Downtown Crossing is unaffected by any of the alternatives because of its geographic orientation to the project site and because of shadows which are cast by existing buildings in this area.

Boston Common

Boston Common is affected by Alternatives 2 and 6 during winter mornings. Alternative 2 adds a relatively small area of net new shadow on a pedestrian walkway. Alternative 6 adds a new shadow across the Common lawn toward Beacon Street.

Other

The ground plane shadow studies focus on conditions at the street level. They are not intended to address shadows which fall upon the sides of buildings. This can be important, however, particularly for buildings with large areas of glass. The Bedford Building, which is directly north of the Essex Street block building, has a glass atrium on its south side which receives net new shadow from all the alternatives during most of the year, except during early mornings from March to September.

Mitigation Measures

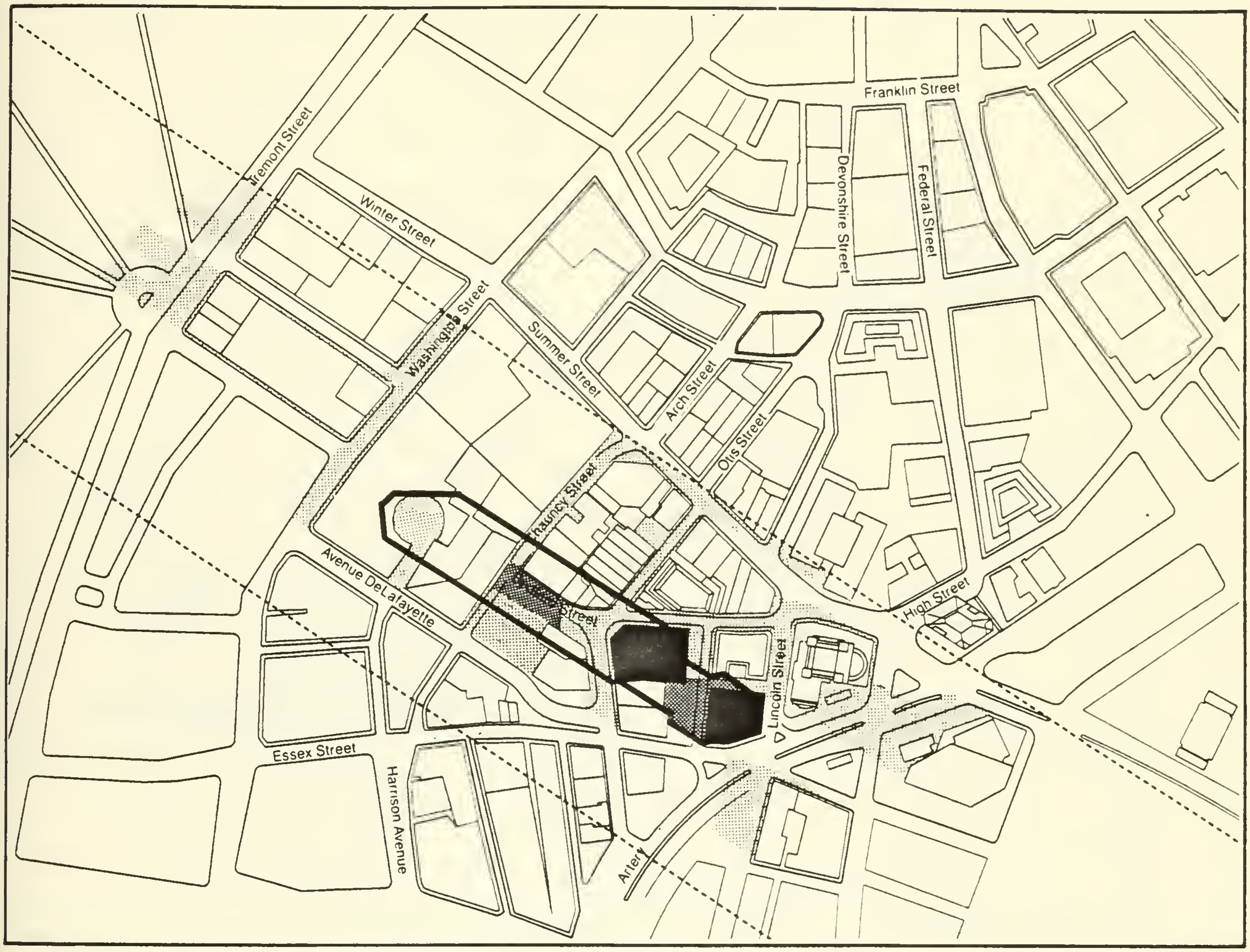
Massing/Visual Quality

A more detailed visual analysis of the project will be undertaken in response to prepared specific development plans submitted to the developer, as those plans evolve from schematic design through working drawings. In accordance with the Boston Redevelopments Authority's Development Review Procedures, the preferred alternative will be reviewed in terms of its architectural character, building materials, view corridors, project massing and height, and facade articulation. Through this review, the final design of the project can be successfully integrated into the existing aesthetic environment of the neighboring Chinatown and Financial districts.

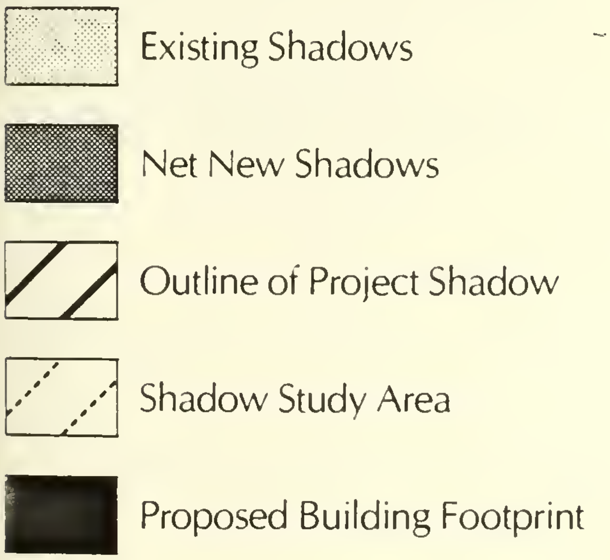
Shadows

All of the proposed build alternatives will cause varying degrees of change to the existing shadow environment and will affect several adjacent pedestrian areas by introducing a net increase in shadows. However, due to the intensely built-up character of the project environs, existing shadows already cover much of the area and relatively little additional shadow will be created by the project, except along Bedford and Columbia Streets. Some additional shadow will fall on the Boston Common from the taller alternatives.

To minimize the shadow impacts from the project, rearrangement of building locations and massing on the site would be required. Reducing the height of the office towers also would reduce the amount of net new shadows in the area. The Final Environmental Impact Report can address ways in which specific project design elements of a preferred alternative can respond to the identified shadow impacts, as well as minimize adverse shadow conditions within the Kingston-Bedford-Essex Street site itself.



March 21 9am-Alt. 2

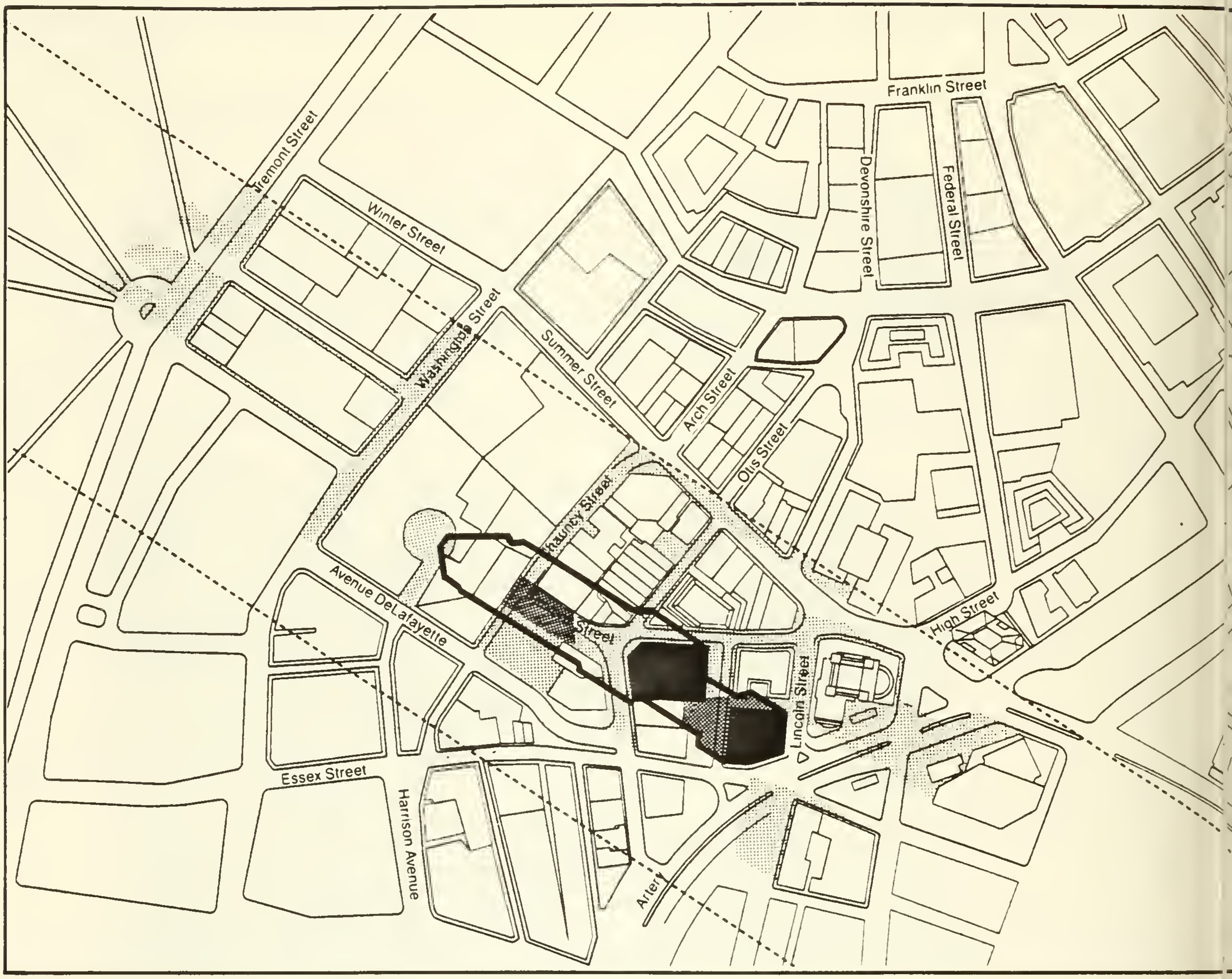


Kingston Bedford Essex Street Project

BOSTON REDEVELOPMENT AUTHORITY

Ground Plane Shadow Studies

Figure IV E-26:
Shadow Studies Alternative 2 (March 21, 9 AM)



March 21 9am-Alt. 3

Existing Shadows

Net New Shadows

Outline of Project Shadow

Shadow Study Area

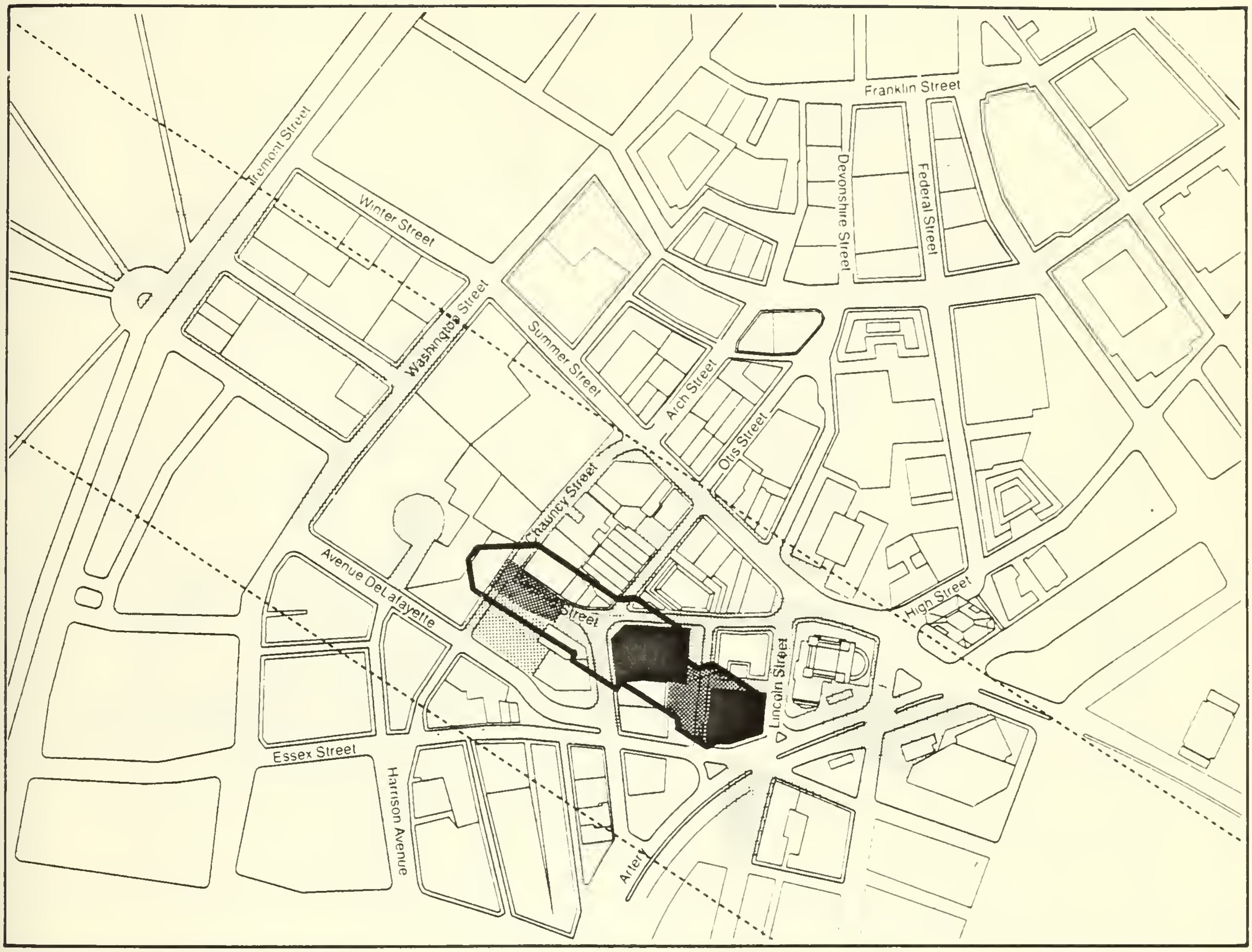
Proposed Building Footprint

Kingston Bedford Essex Street Pro

BOSTON REDEVELOPMENT AUTHOR

Ground Plane Shadow Studies

Figure IV E-27:
Shadow Studies Alternative 3 (March 21, 9 AM)



March 21 9am-Alt. 4

Existing Shadows

Net New Shadows

Outline of Project Shadow

Shadow Study Area

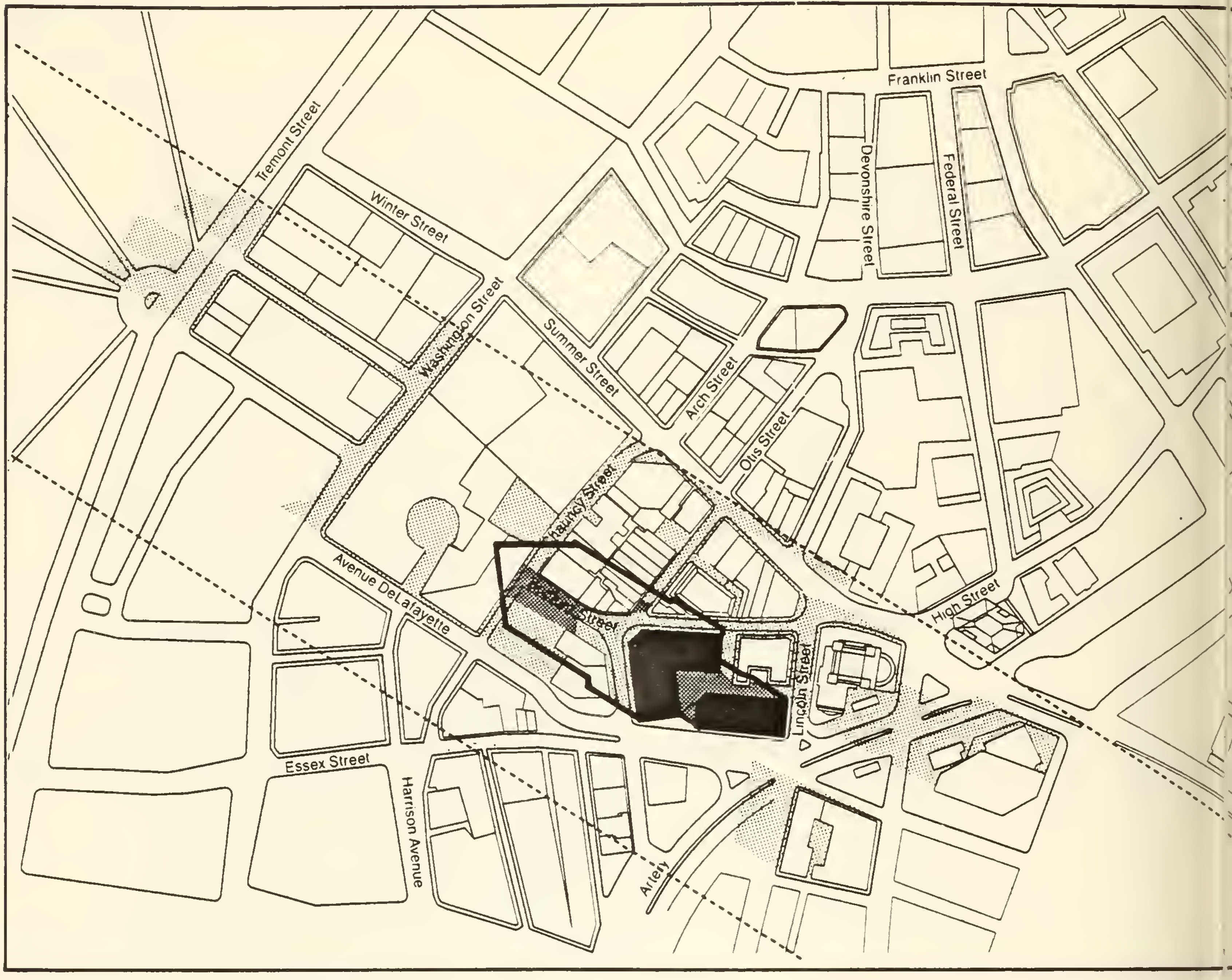
Proposed Building Footprint

Kingston Bedford Essex Street Project

BOSTON REDEVELOPMENT AUTHORITY

Ground Plane Shadow Studies

Figure IV E-28:
Shadow Studies Alternative 4 (March 21, 9 AM)



March 21 9am-Alt. 5

Existing Shadows

Net New Shadows

Outline of Project Shadow

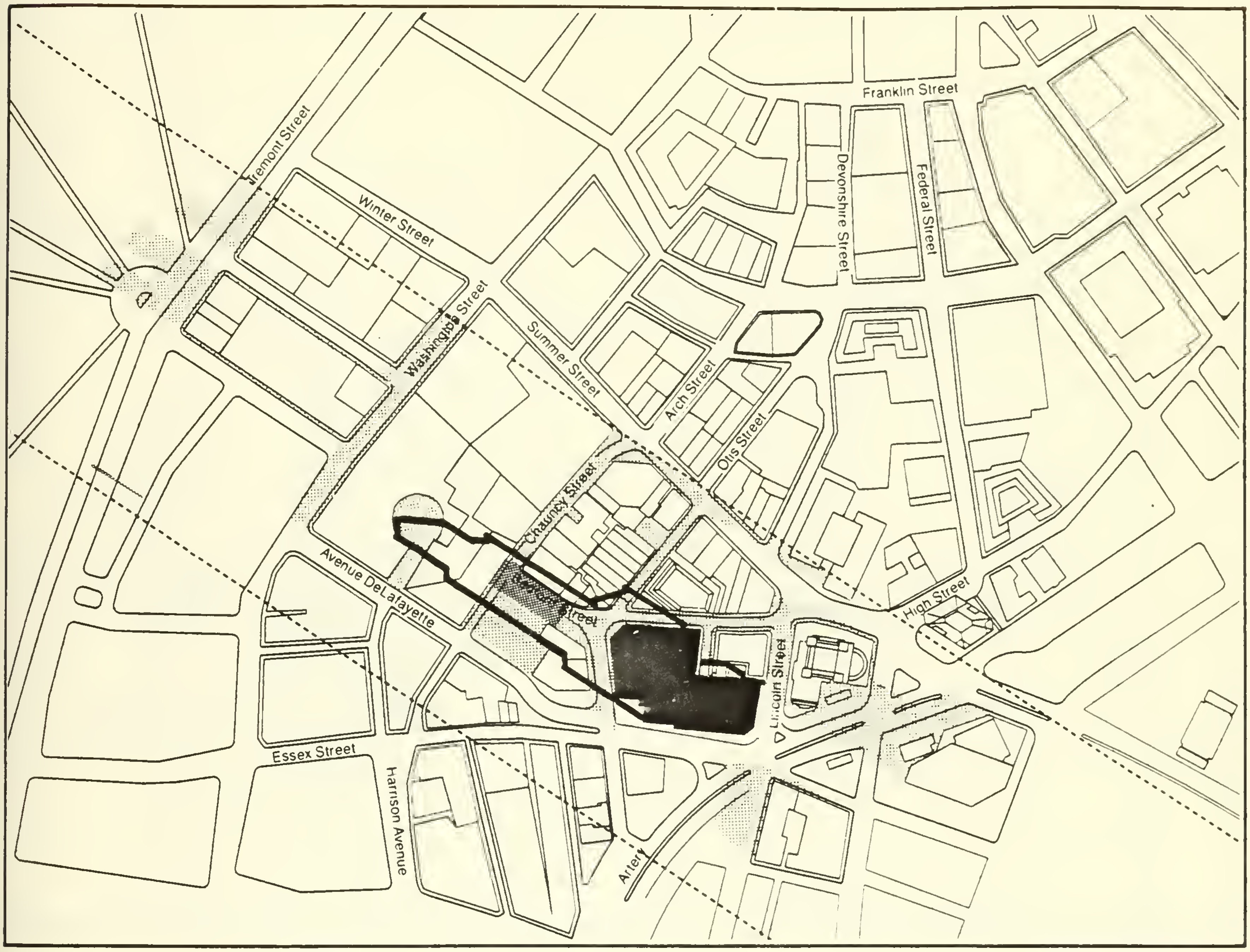
Shadow Study Area

Proposed Building Footprint

Kingston Bedford Essex Street Proj
BOSTON REDEVELOPMENT AUTHOR

Ground Plane Shadow Studies

Figure IV E-29:
Shadow Studies Alternative 5 (March 21, 9 AM)



March 21 9am-Alt. 6

Existing Shadows

Net New Shadows

Outline of Project Shadow

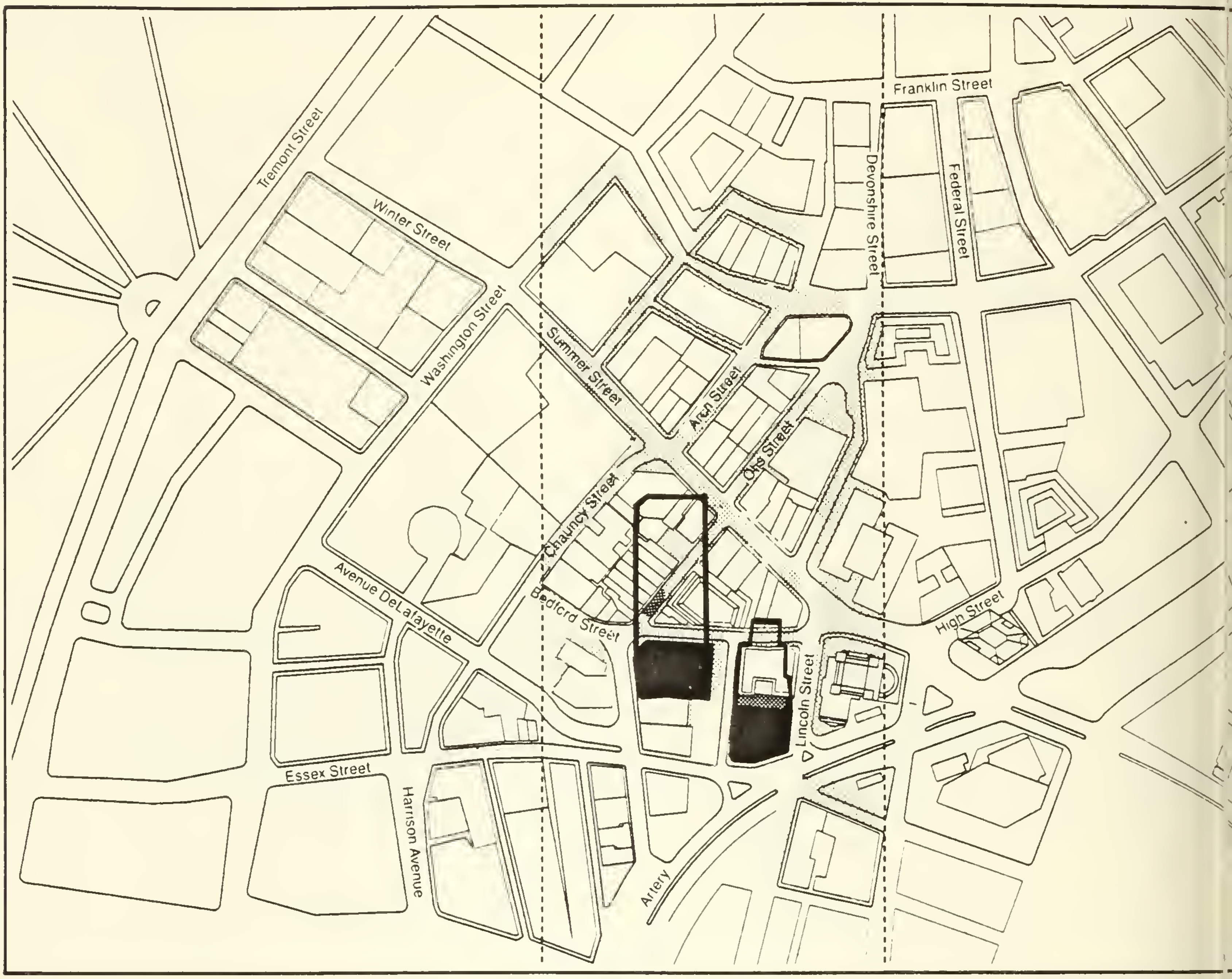
Shadow Study Area

Proposed Building Footprint

Kingston Bedford Essex Street Project
BOSTON REDEVELOPMENT AUTHORITY

Ground Plane Shadow Studies

Figure IV E-30:
Shadow Studies Alternative 6 (March 21, 9 AM)



March 21 Noon-Alt. 2

Existing Shadows

Net New Shadows

Outline of Project Shadow

Shadow Study Area

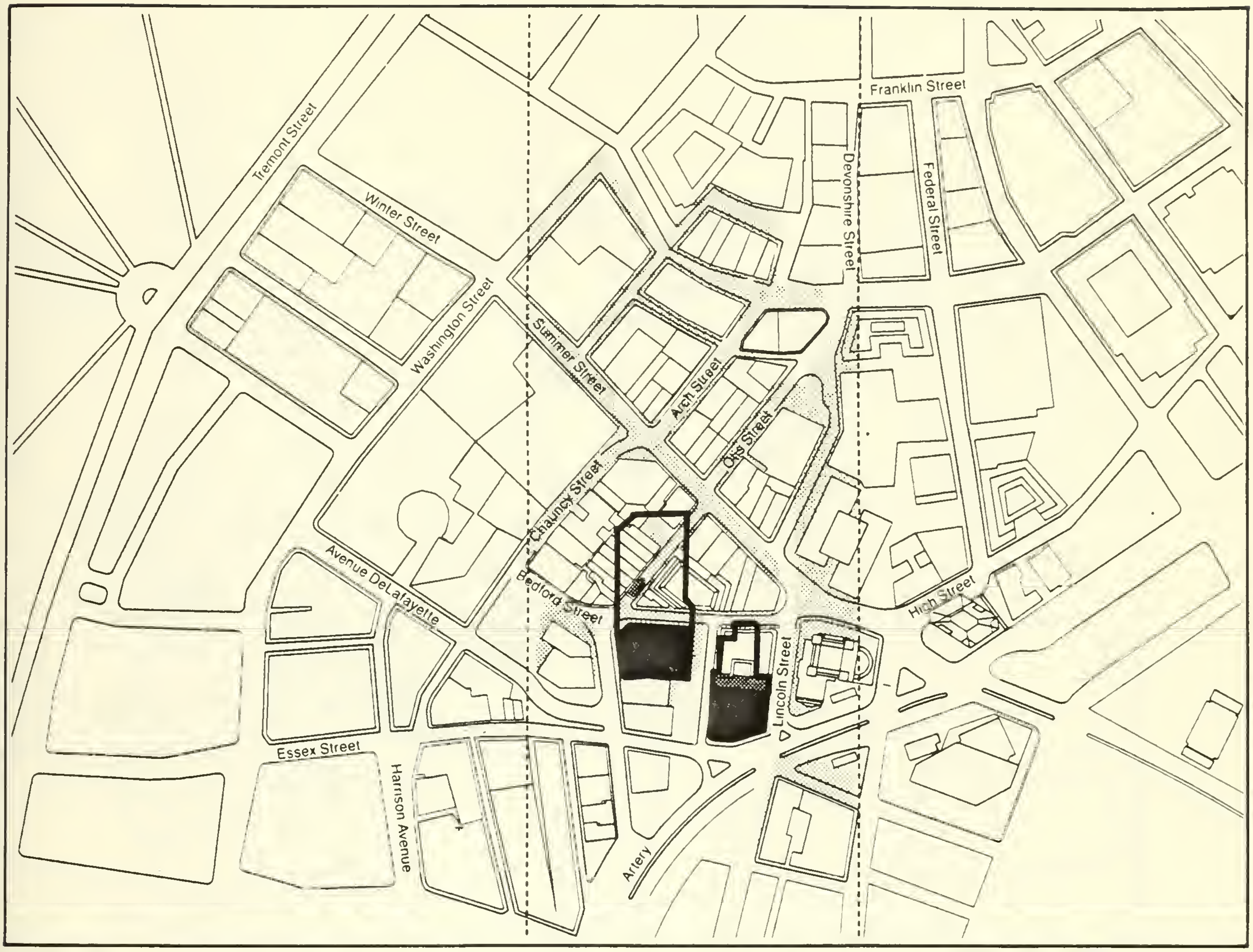
Proposed Building Footprint

Kingston Bedford Essex Street Pro

BOSTON REDEVELOPMENT AUTHOR

Ground Plane Shadow Studies

Figure IV E-31:
Shadow Studies Alternative 2 (March 21, Noon)



March 21 Noon-Alt. 3

Existing Shadows

Net New Shadows

Outline of Project Shadow

Shadow Study Area

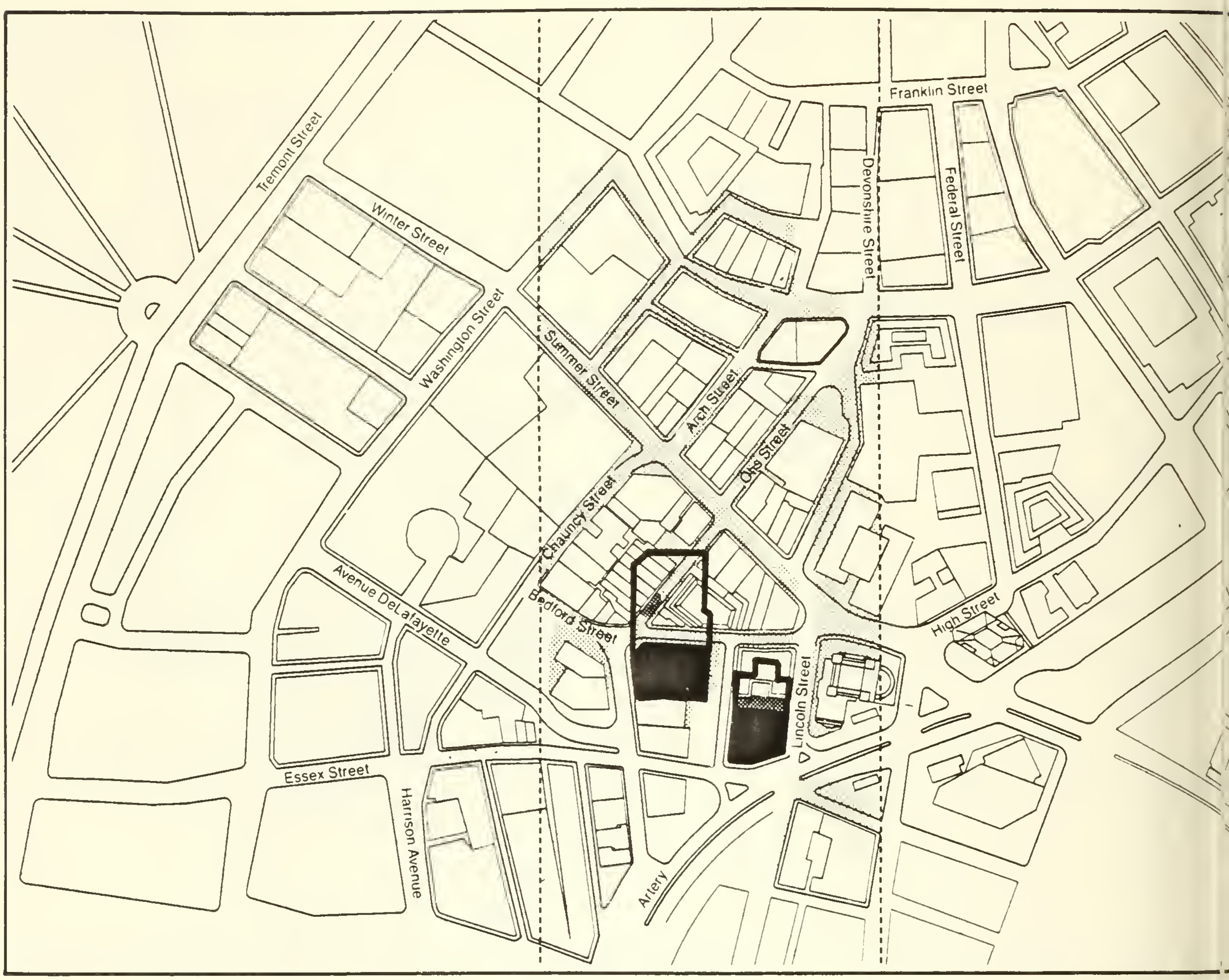
Proposed Building Footprint

Kingston Bedford Essex Street Project

BOSTON REDEVELOPMENT AUTHORITY

Ground Plane Shadow Studies

Figure IV E-32:
Shadow Studies Alternative 3 (March 21, Noon)



March 21 Noon-Alt. 4

Existing Shadows

Net New Shadows

Outline of Project Shadow

Shadow Study Area

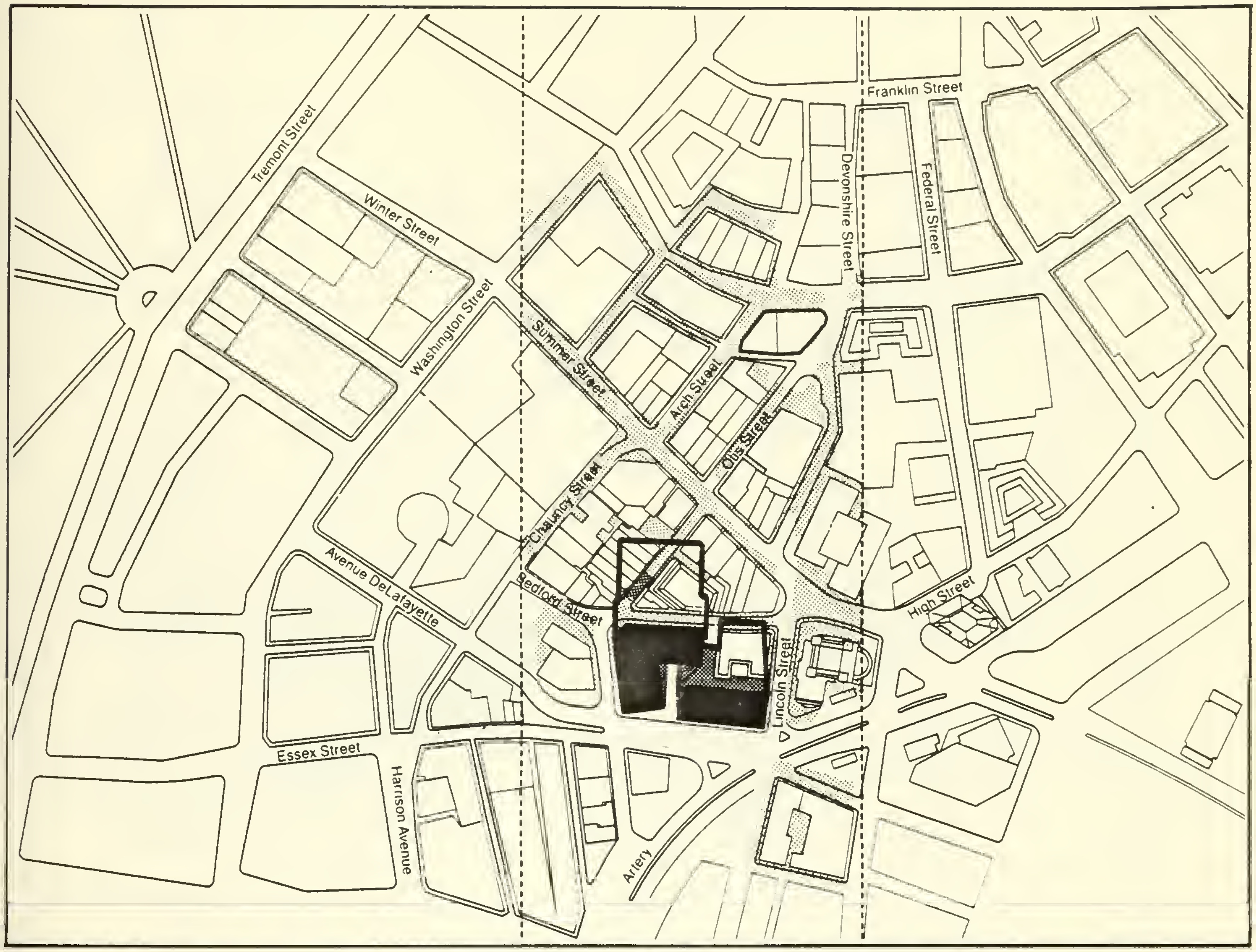
Proposed Building Footprint

Kingston Bedford Essex Street Pro

BOSTON REDEVELOPMENT AUTHOR

Ground Plane Shadow Studies

Figure IV E-33:
Shadow Studies Alternative 4 (March 21, Noon)



March 21 Noon-Alt. 5

Existing Shadows

Net New Shadows

Outline of Project Shadow

Shadow Study Area

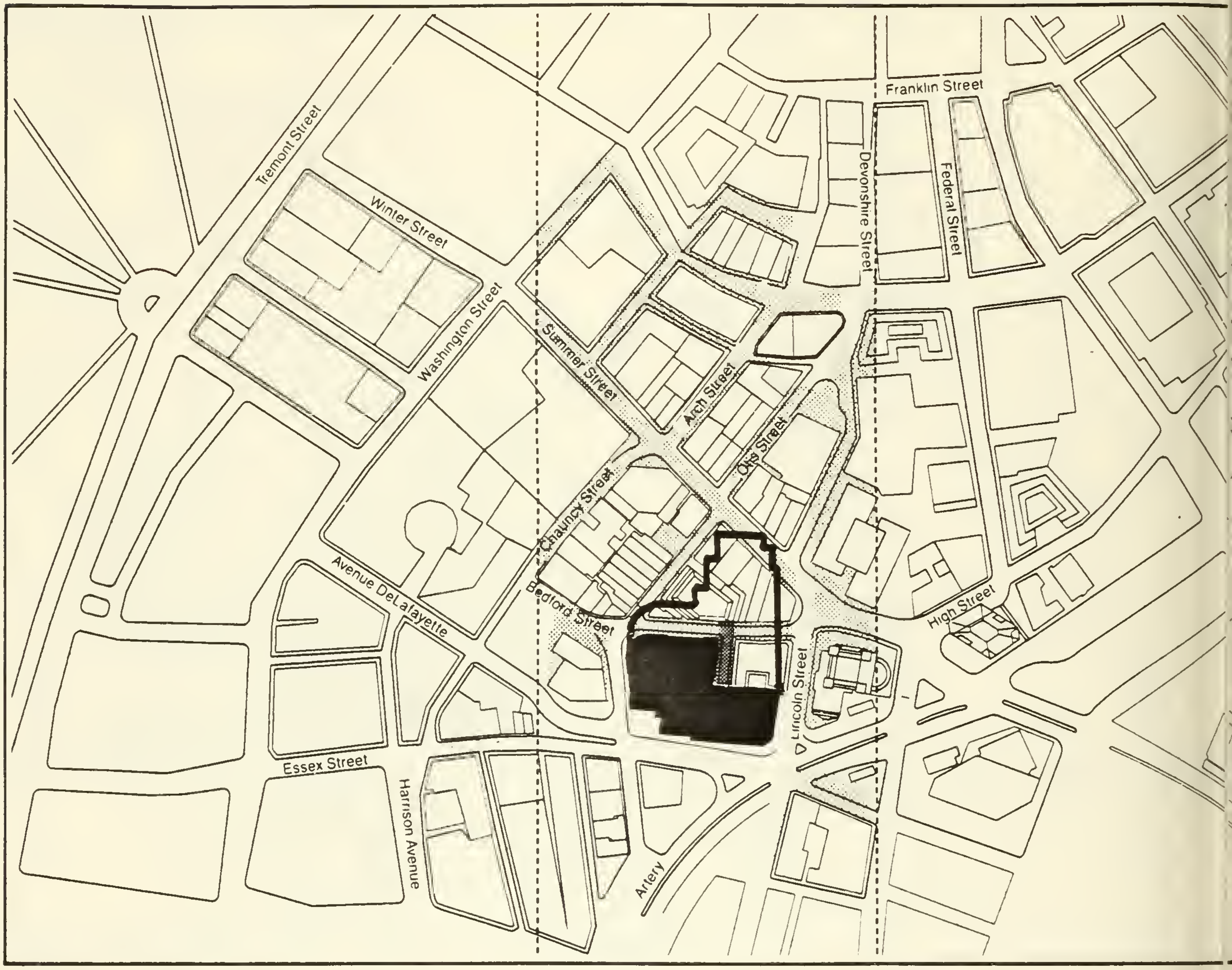
Proposed Building Footprint

Kingston Bedford Essex Street Project

BOSTON REDEVELOPMENT AUTHORITY

Ground Plane Shadow Studies

Figure IV E-34:
Shadow Studies Alternative 5 (March 21, Noon)



March 21 Noon-Alt. 6

Existing Shadows

Net New Shadows

Outline of Project Shadow

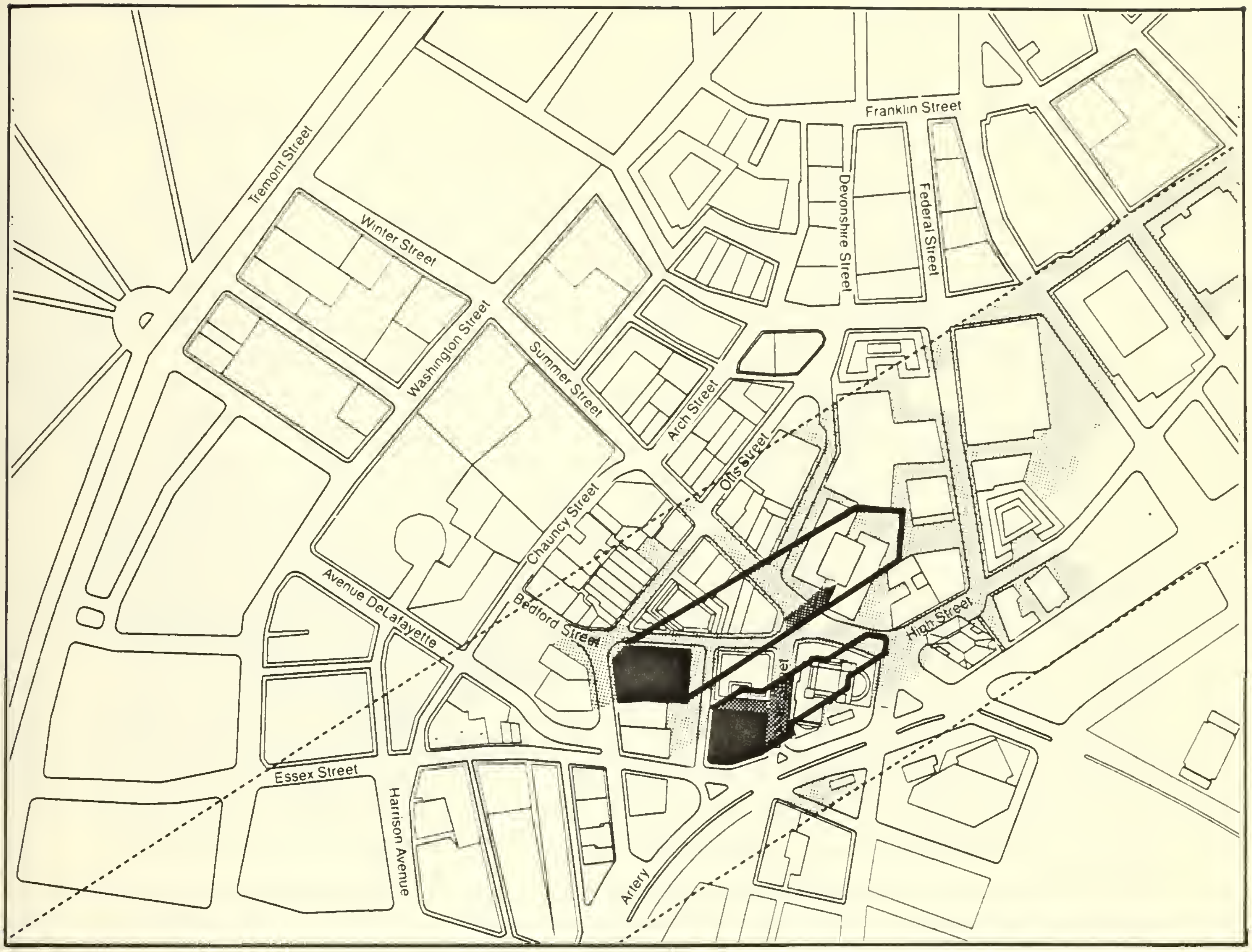
Shadow Study Area

Proposed Building Footprint

Kingston Bedford Essex Street Proj
BOSTON REDEVELOPMENT AUTHORI

Ground Plane Shadow Studies

Figure IV E-35:
Shadow Studies Alternative 6 (March 21, Noon)



March 21 3pm-Alt. 2

Existing Shadows

Net New Shadows

Outline of Project Shadow

Shadow Study Area

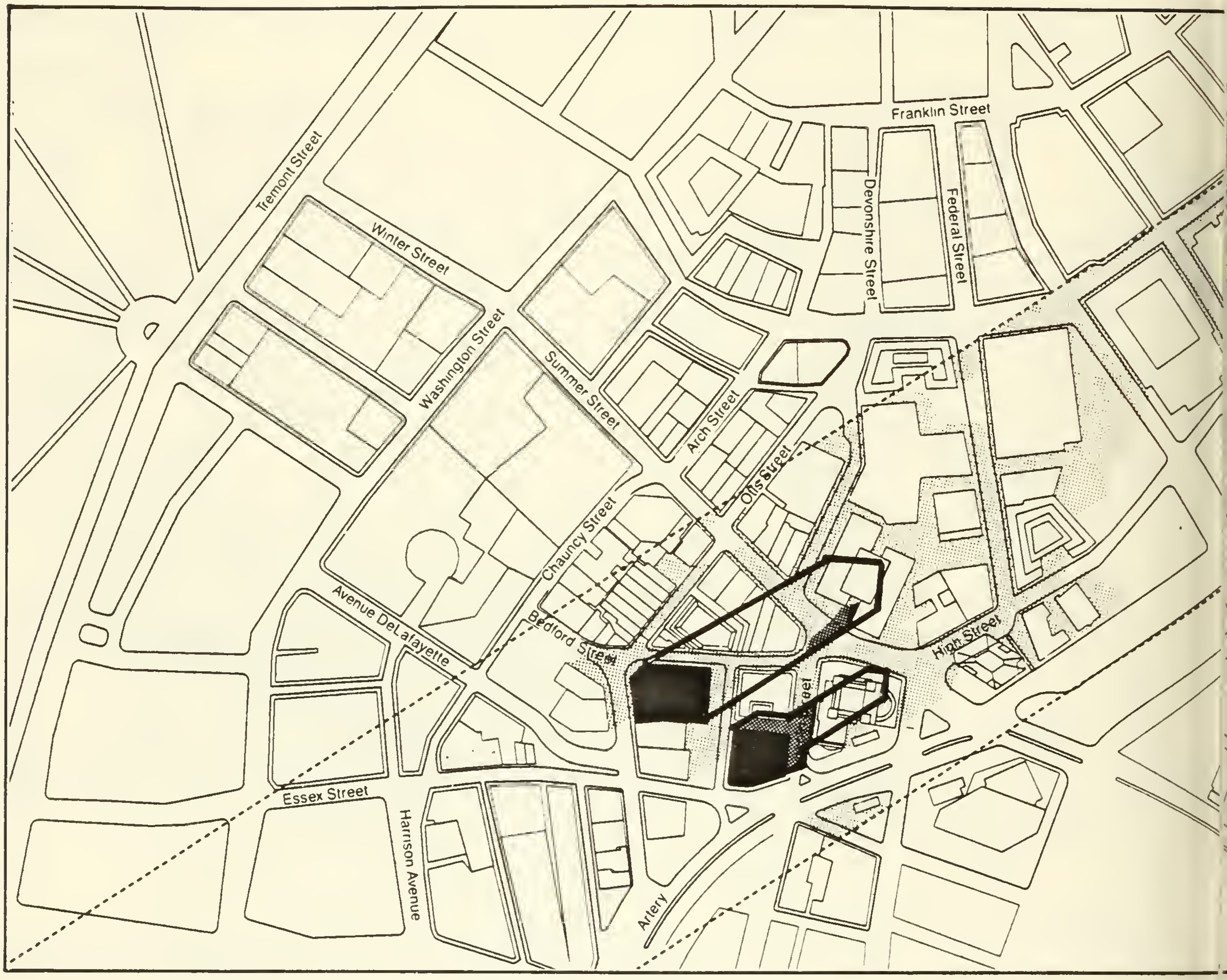
Proposed Building Footprint

Kingston Bedford Essex Street Project

BOSTON REDEVELOPMENT AUTHORITY

Ground Plane Shadow Studies

Figure IV E-36:
Shadow Studies Alternative 2 (March 21, 3 PM)



March 21 3pm-Alt. 3

Existing Shadows

Net New Shadows

Outline of Project Shadow

Shadow Study Area

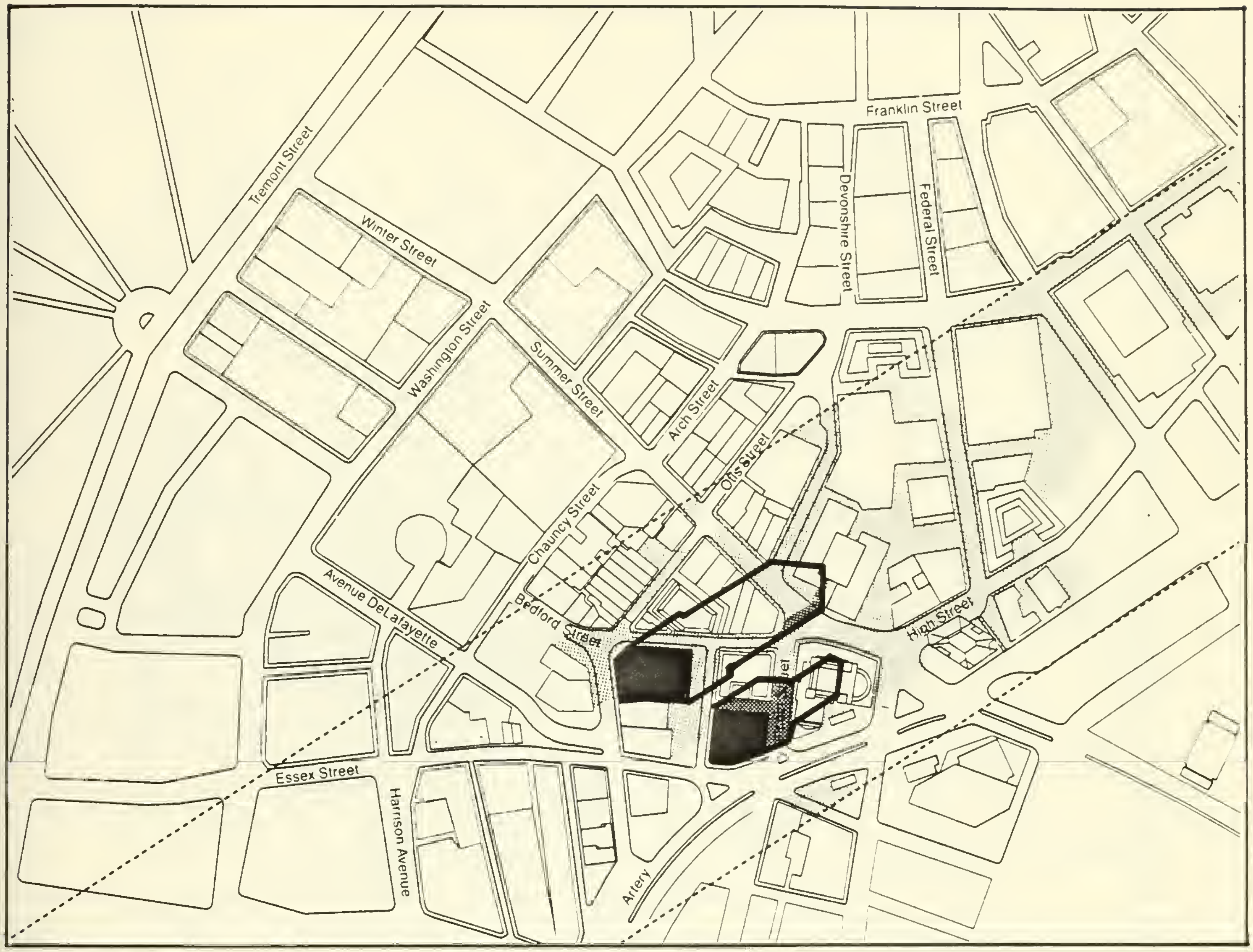
Proposed Building Footprint

Kingston Bedford Essex Street Pro

BOSTON REDEVELOPMENT AUTHOI

Ground Plane Shadow Studies

Figure IV E-37:
Shadow Studies Alternative 3 (March 21, 3 PM)



March 21 3pm-Alt. 4

Existing Shadows

Net New Shadows

Outline of Project Shadow

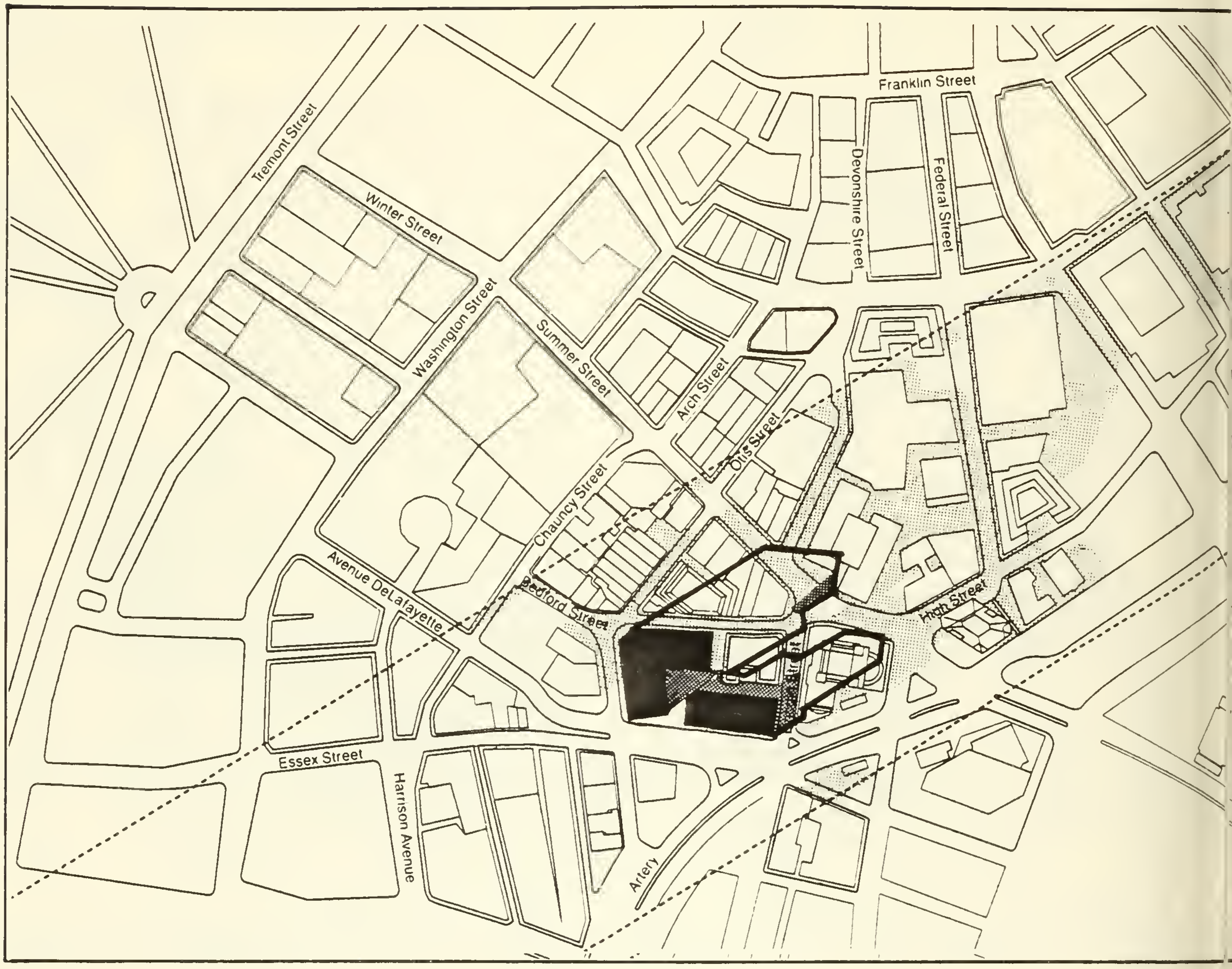
Shadow Study Area

Proposed Building Footprint

Kingston Bedford Essex Street Project
BOSTON REDEVELOPMENT AUTHORITY

Ground Plane Shadow Studies

Figure IV E-38:
Shadow Studies Alternative 4 (March 21, 3 PM)



March 21 3pm-Alt. 5

Existing Shadows

Net New Shadows

Outline of Project Shadow

Shadow Study Area

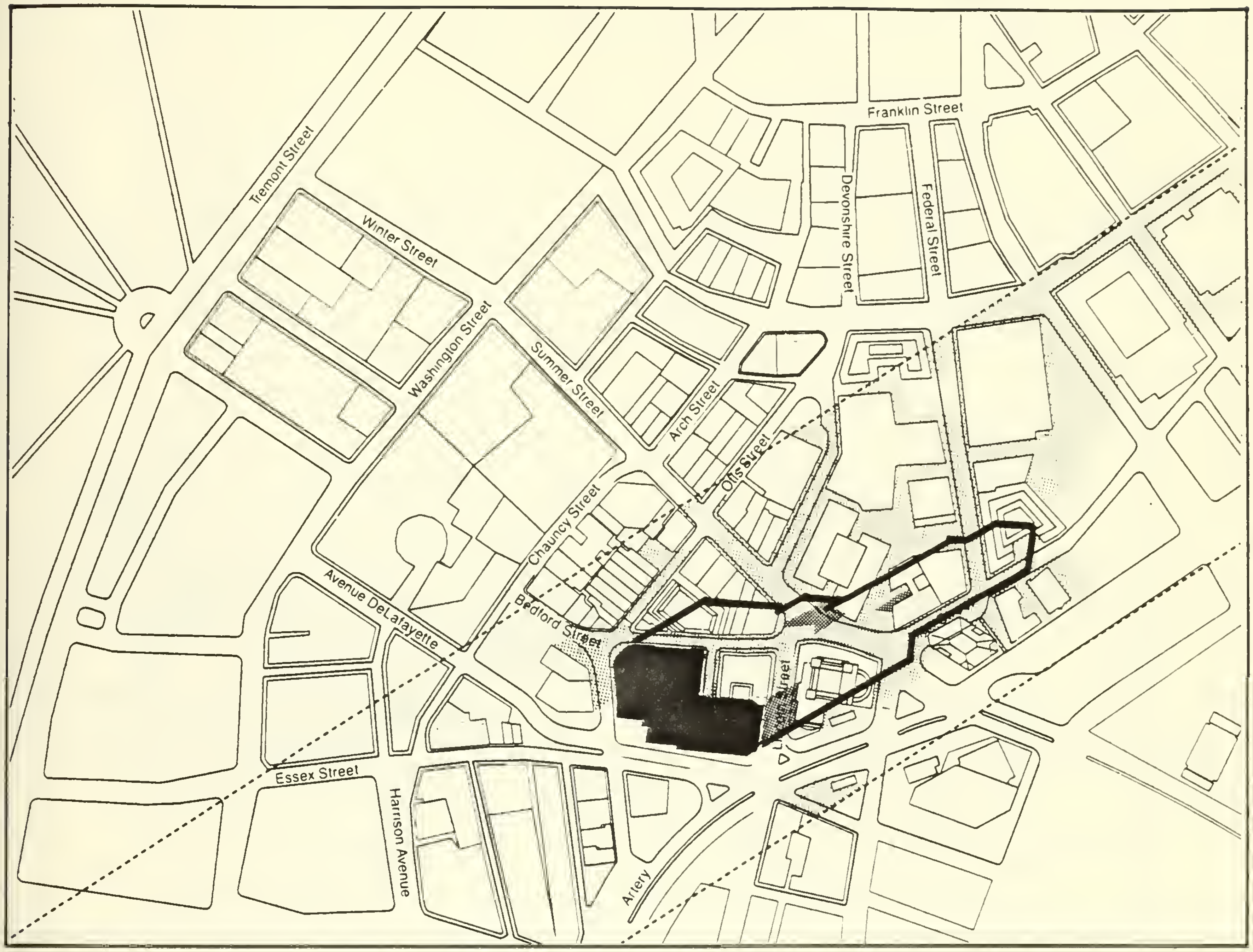
Proposed Building Footprint

Kingston Bedford Essex Street Proj

BOSTON REDEVELOPMENT AUTHORI

Ground Plane Shadow Studies

Figure IV E-39:
Shadow Studies Alternative 5 (March 21, 3 PM)



March 21 3pm-Alt. 6

Existing Shadows

Net New Shadows

Outline of Project Shadow

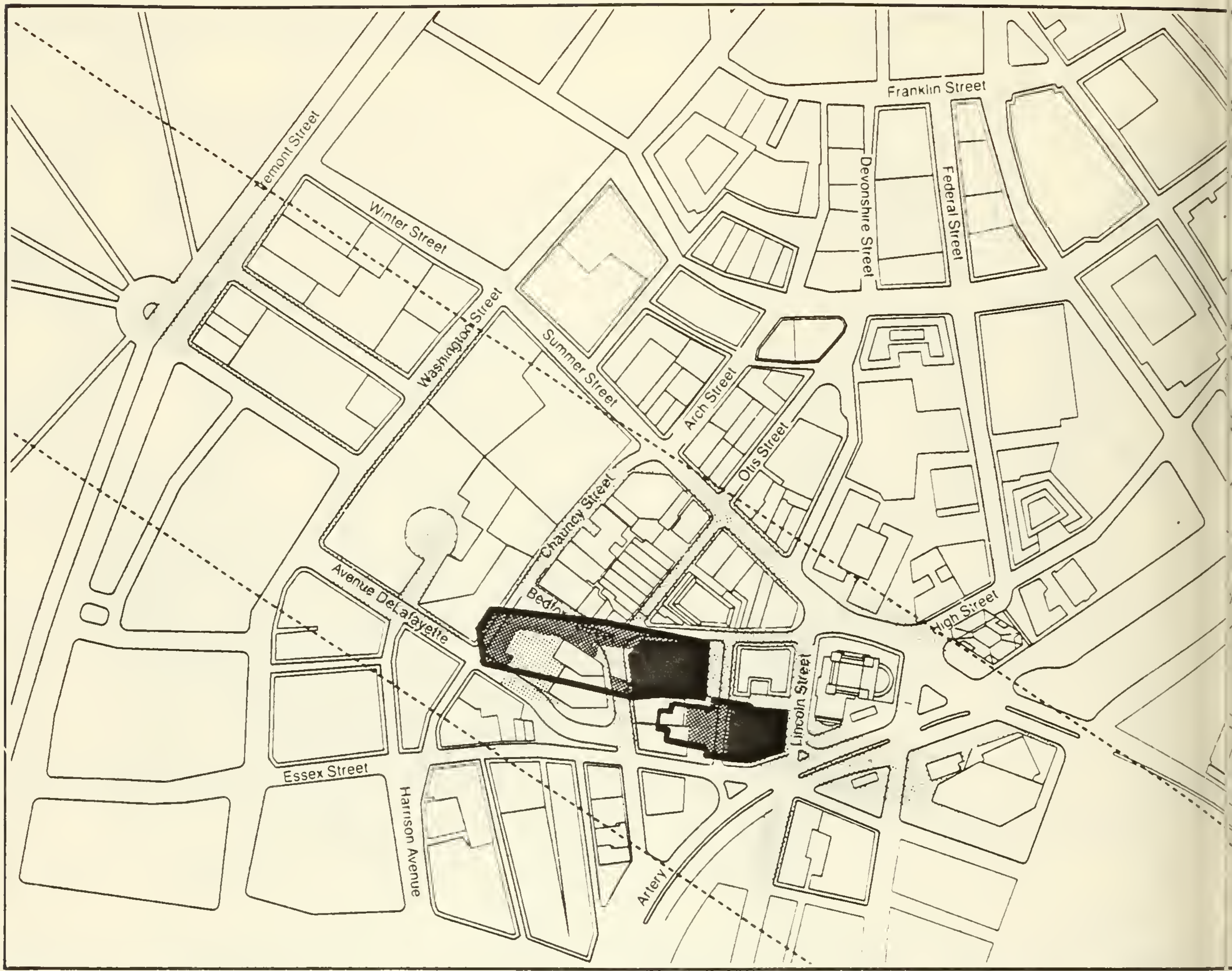
Shadow Study Area

Proposed Building Footprint

Kingston Bedford Essex Street Project
BOSTON REDEVELOPMENT AUTHORITY

Ground Plane Shadow Studies

Figure IV E-40:
Shadow Studies Alternative 6 (March 21, 3 PM)



June 22 9am-Alt. 2

Existing Shadows

Net New Shadows

Outline of Project Shadow

Shadow Study Area

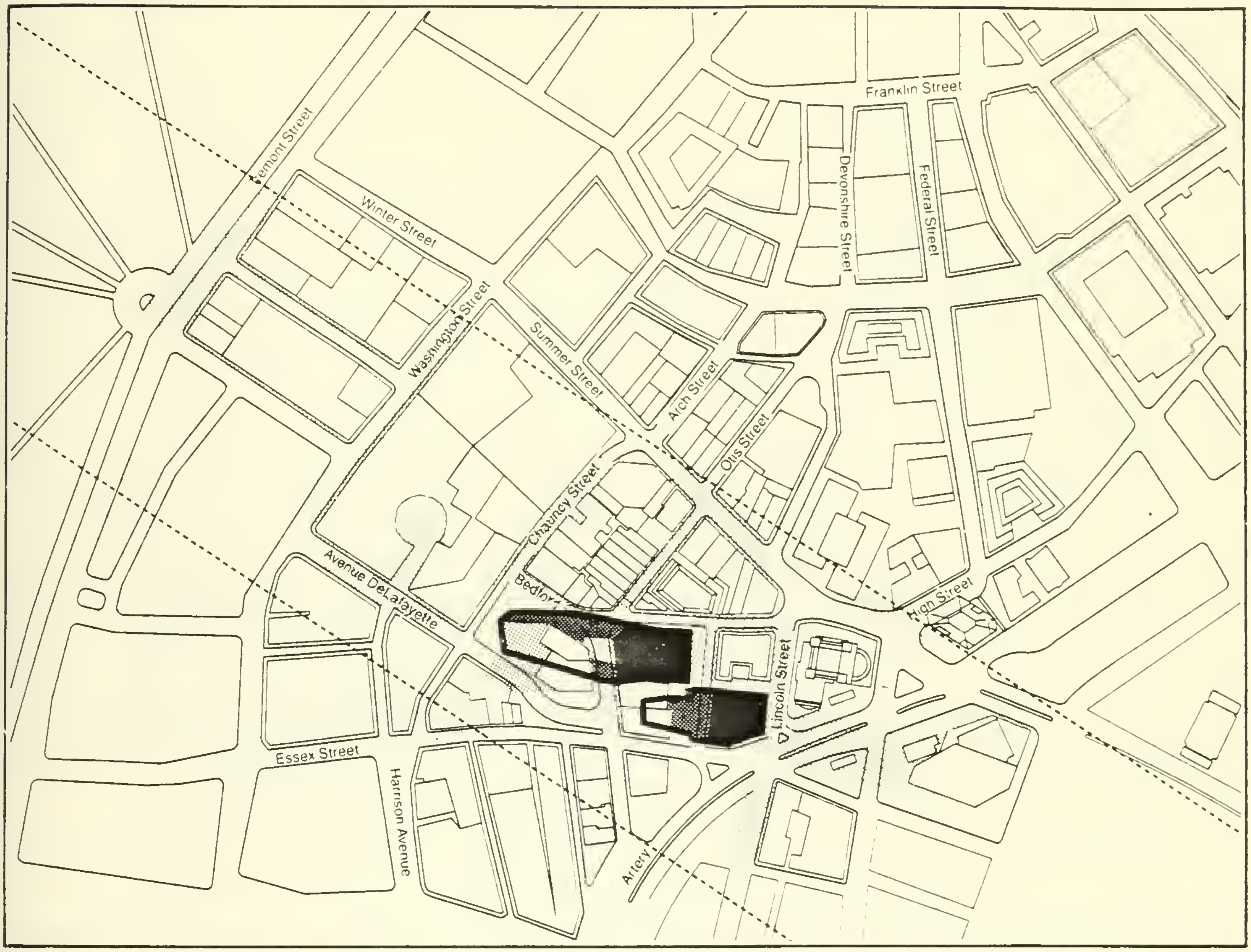
Proposed Building Footprint

Kingston Bedford Essex Street Proj

BOSTON REDEVELOPMENT AUTHOR

Ground Plane Shadow Studies

Figure IV E-41:
Shadow Studies Alternative 2 (June 22, 9 AM)



June 22 9am-Alt. 3

Existing Shadows

Net New Shadows

Outline of Project Shadow

Shadow Study Area

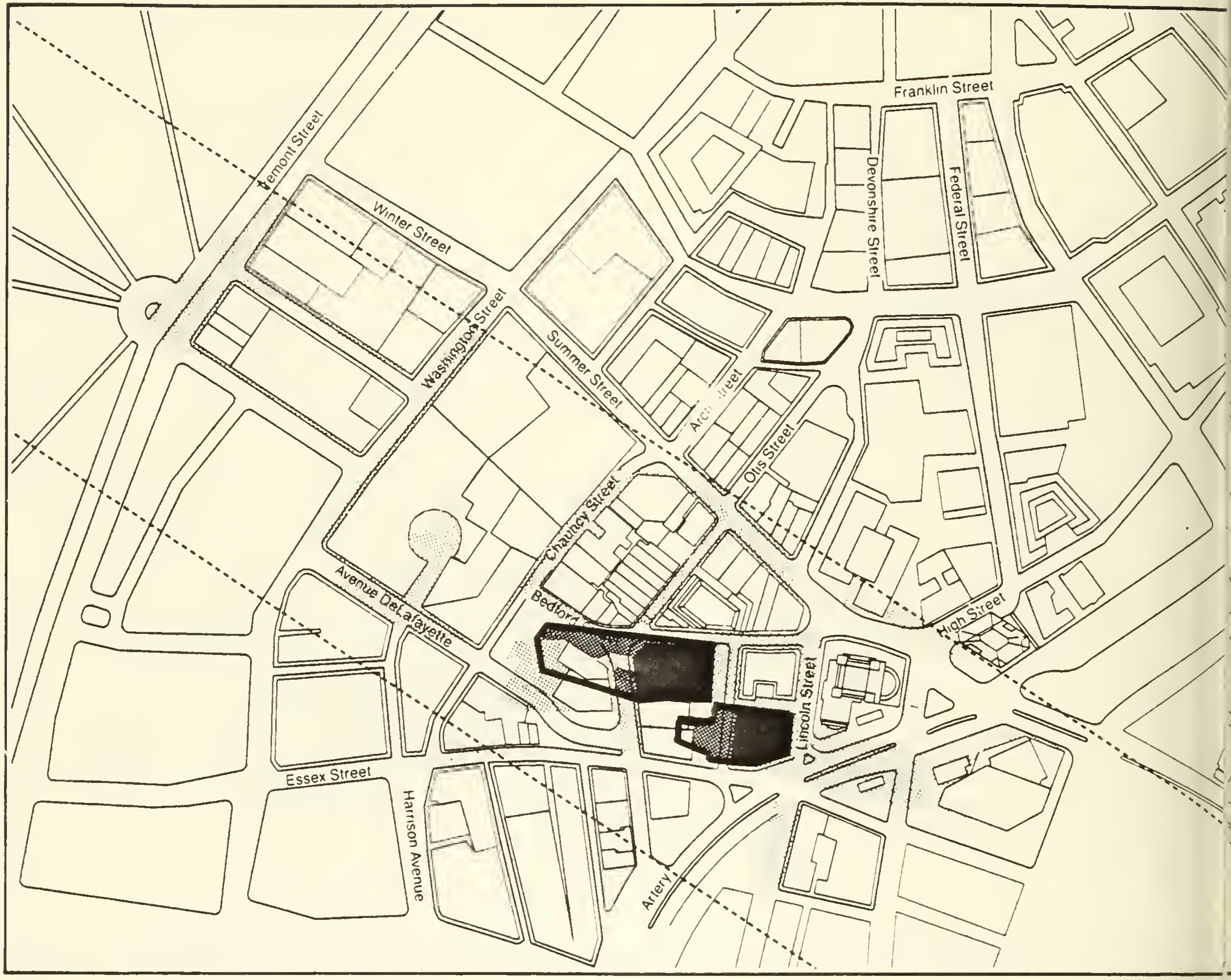
Proposed Building Footprint

Kingston Bedford Essex Street Project

BOSTON REDEVELOPMENT AUTHORITY

Ground Plane Shadow Studies

Figure IV E-42:
Shadow Studies Alternative 3 (June 22, 9 AM)



June 22 9am-Alt. 4

Existing Shadows

Net New Shadows

Outline of Project Shadow

Shadow Study Area

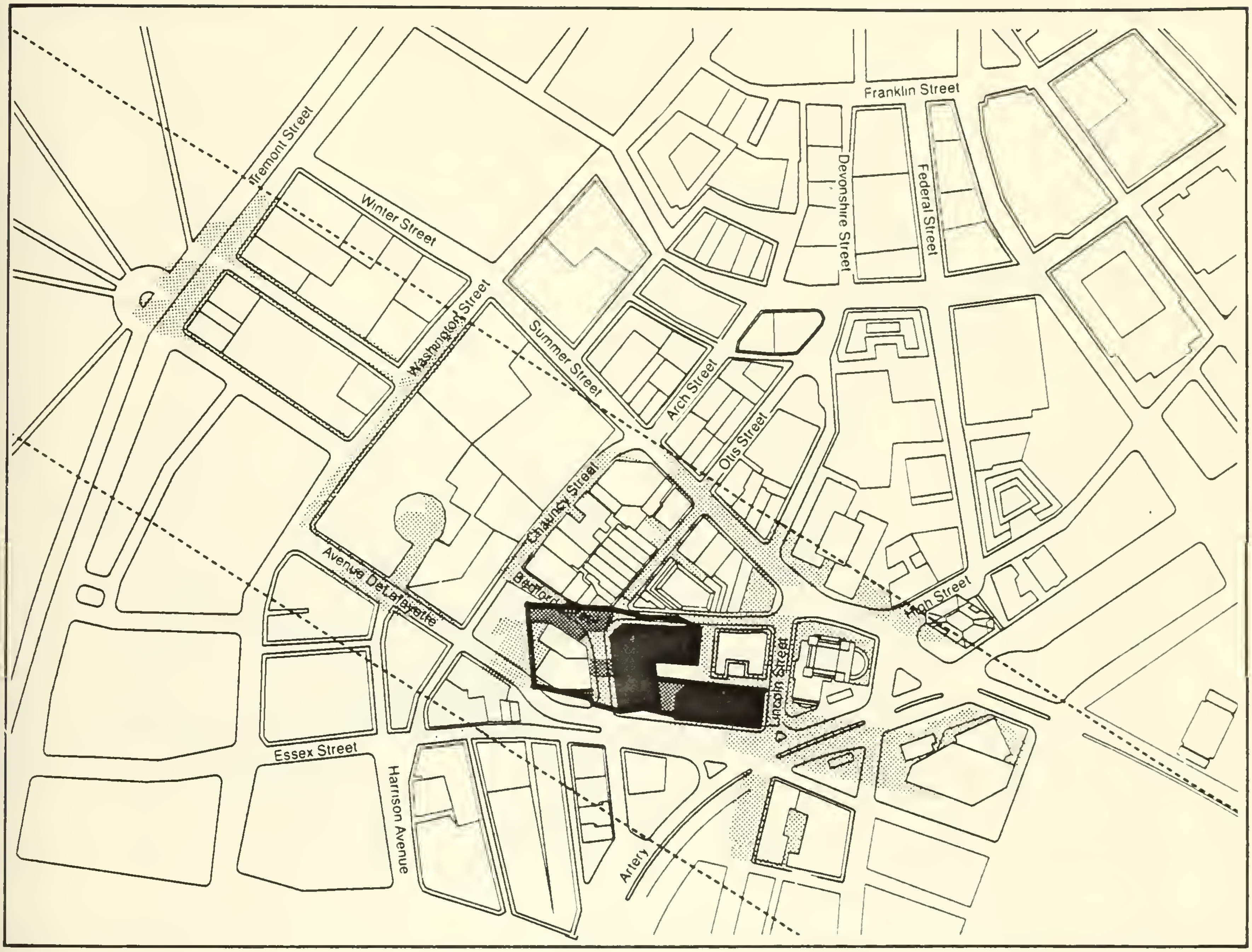
Proposed Building Footprint

Kingston Bedford Essex Street Pro

BOSTON REDEVELOPMENT AUTHOI

Ground Plane Shadow Studies

Figure IV E-43:
Shadow Studies Alternative 4 (June 22, 9 AM)



June 22 9am-Alt. 5

Existing Shadows

Net New Shadows

Outline of Project Shadow

Shadow Study Area

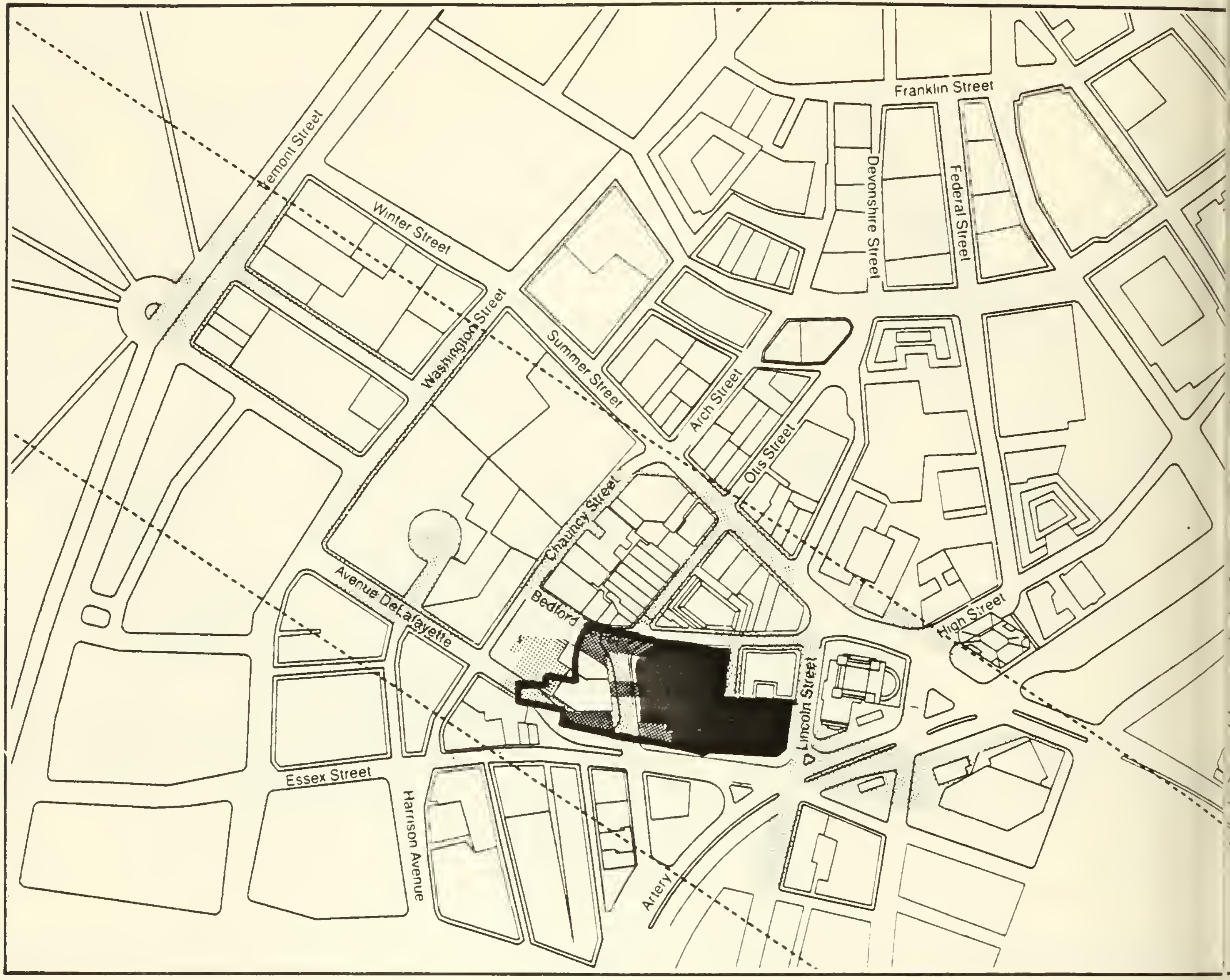
Proposed Building Footprint

Kingston Bedford Essex Street Project

BOSTON REDEVELOPMENT AUTHORITY

Ground Plane Shadow Studies

Figure IV E-44:
Shadow Studies Alternative 5 (June 22, 9 AM)



June 22 9am-Alt. 6

Existing Shadows

Net New Shadows

Outline of Project Shadow

Shadow Study Area

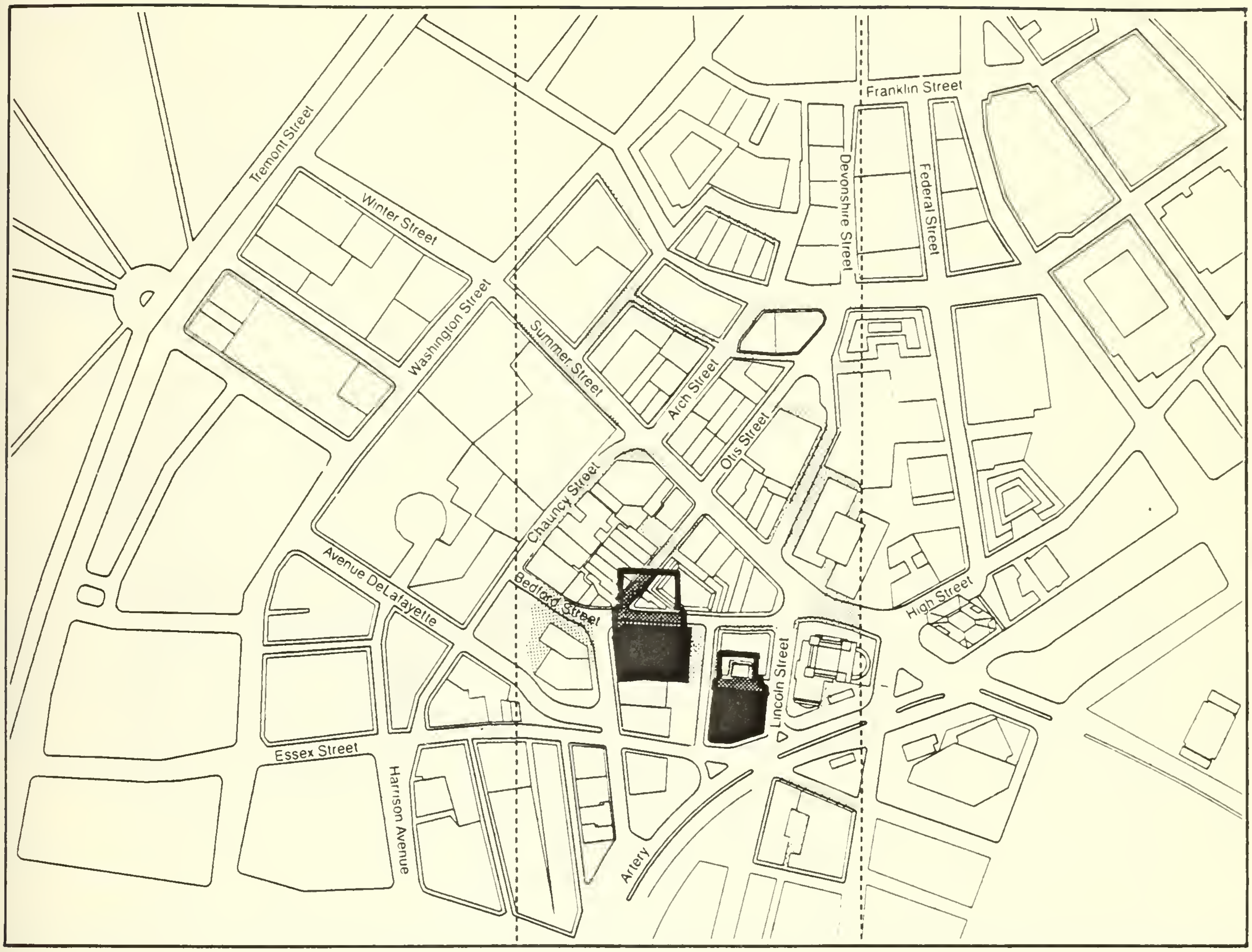
Proposed Building Footprint

Kingston Bedford Essex Street Pro

BOSTON REDEVELOPMENT AUTHOI

Ground Plane Shadow Studies

Figure IV E-45:
Shadow Studies Alternative 6 (June 22, 9 AM)



June 22 Noon-Alt. 2

Existing Shadows

Net New Shadows

Outline of Project Shadow

Shadow Study Area

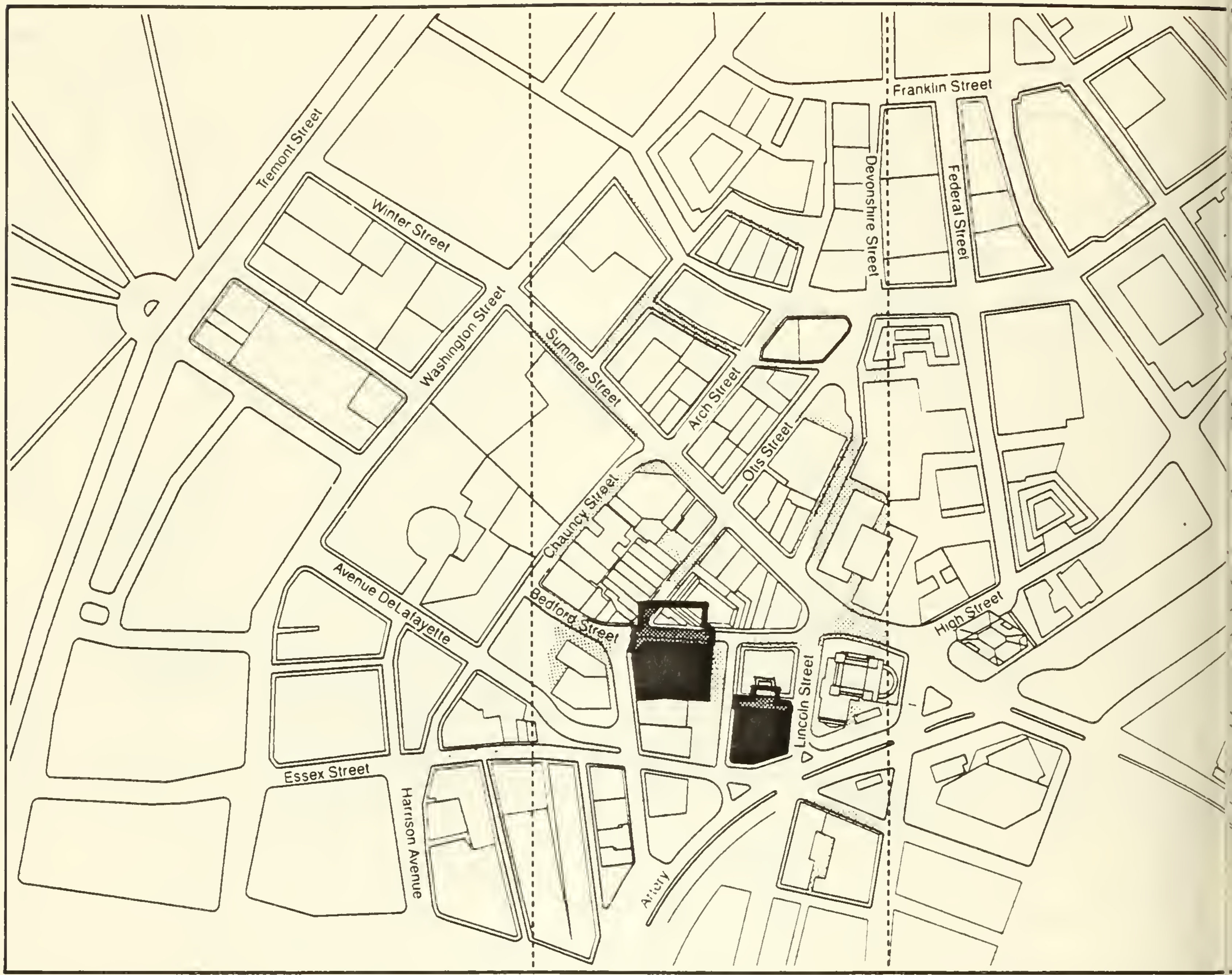
Proposed Building Footprint

Kingston Bedford Essex Street Project

BOSTON REDEVELOPMENT AUTHORITY

Ground Plane Shadow Studies

Figure IV E-46:
Shadow Studies Alternative 2 (June 22, Noon)



June 22 Noon-Alt. 3

Existing Shadows

Net New Shadows

Outline of Project Shadow

Shadow Study Area

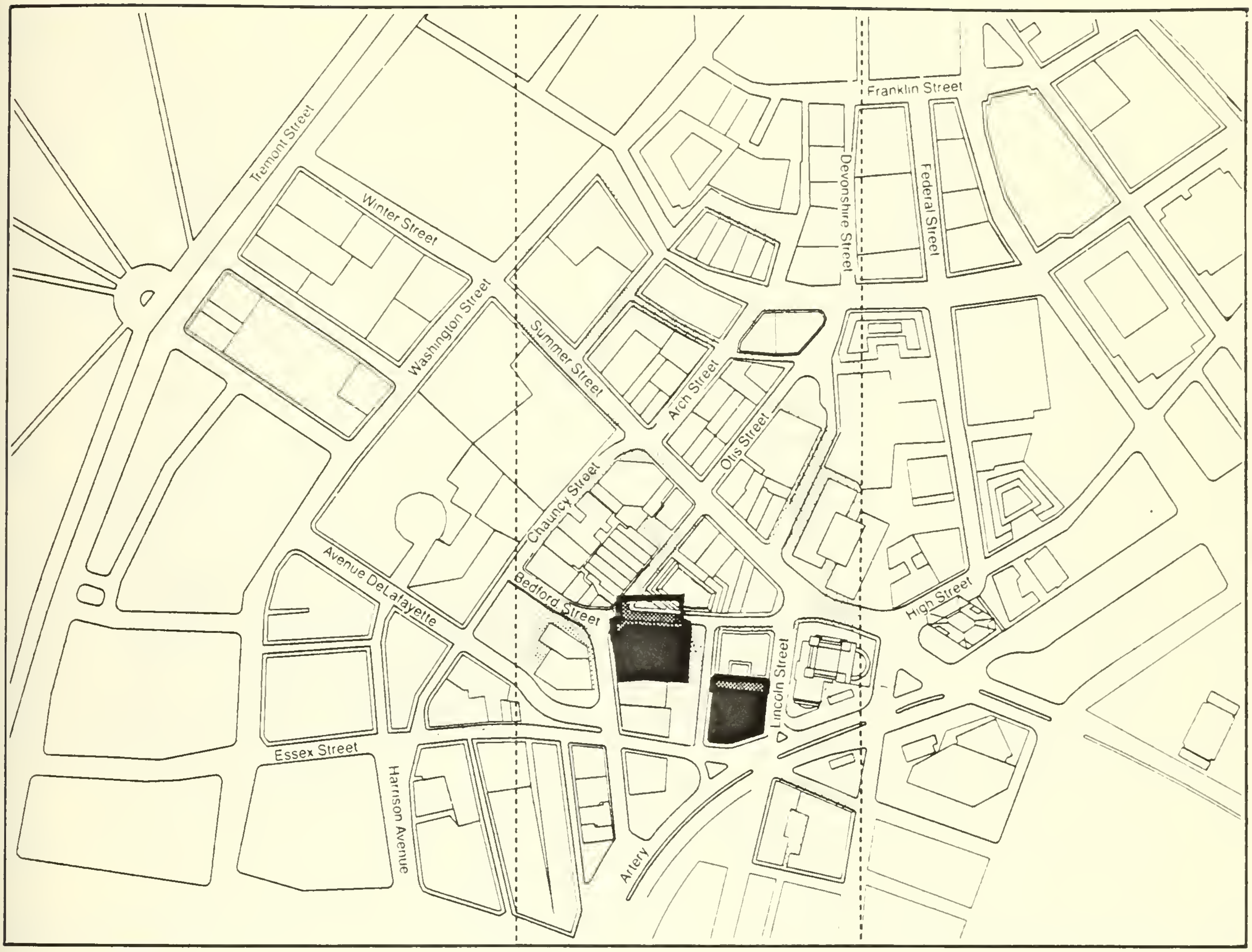
Proposed Building Footprint

Kingston Bedford Essex Street Pro

BOSTON REDEVELOPMENT AUTHOR

Ground Plane Shadow Studies

Figure IV E-47:
Shadow Studies Alternative 3 (June 22, Noon)



June 22 Noon-Alt. 4

Existing Shadows

Net New Shadows

Outline of Project Shadow

Shadow Study Area

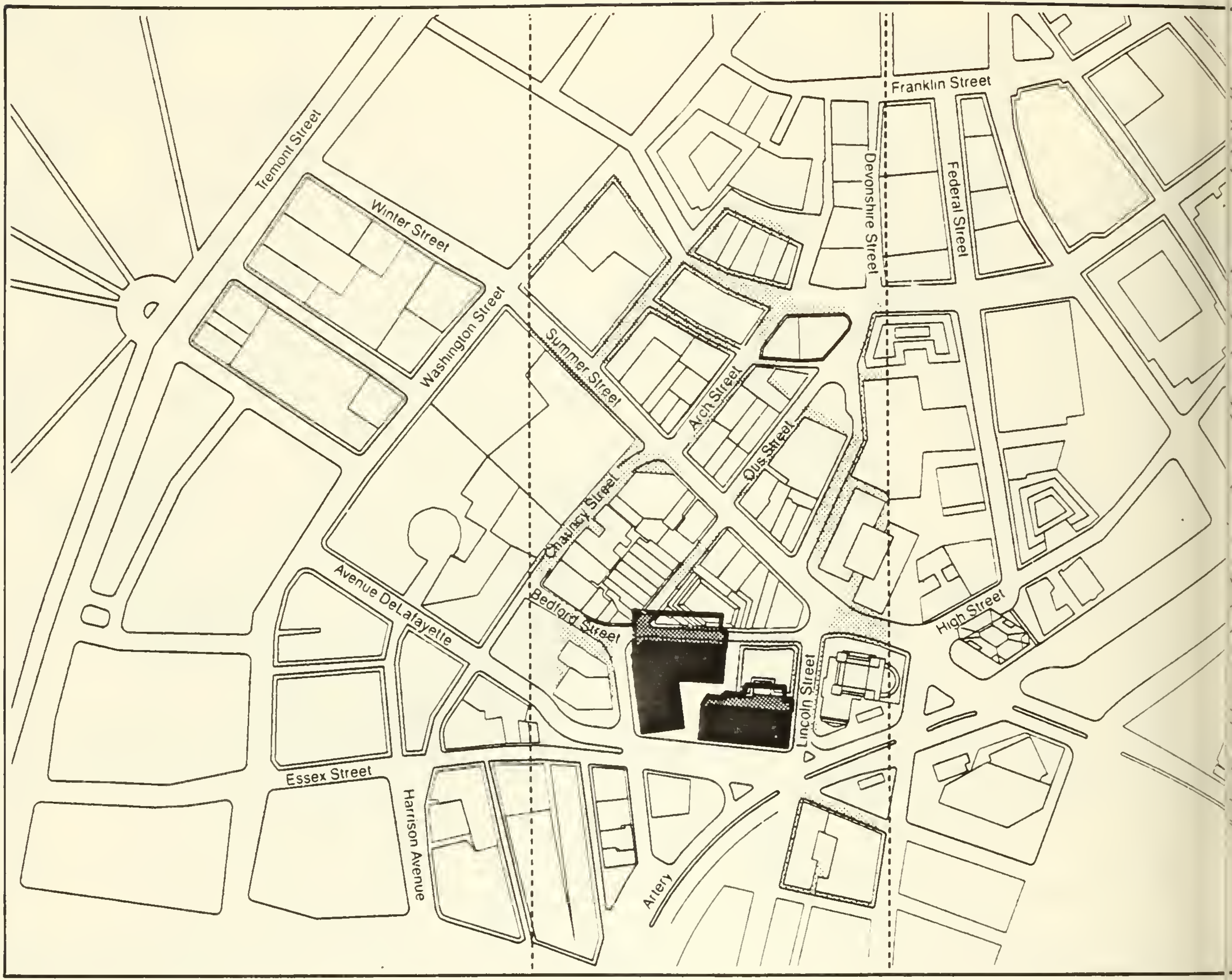
Proposed Building Footprint

Kingston Bedford Essex Street Project

BOSTON REDEVELOPMENT AUTHORITY

Ground Plane Shadow Studies

Figure IV E-48:
Shadow Studies Alternative 4 (June 22, Noon)



June 22 Noon-Alt. 5

Existing Shadows

Net New Shadows

Outline of Project Shadow

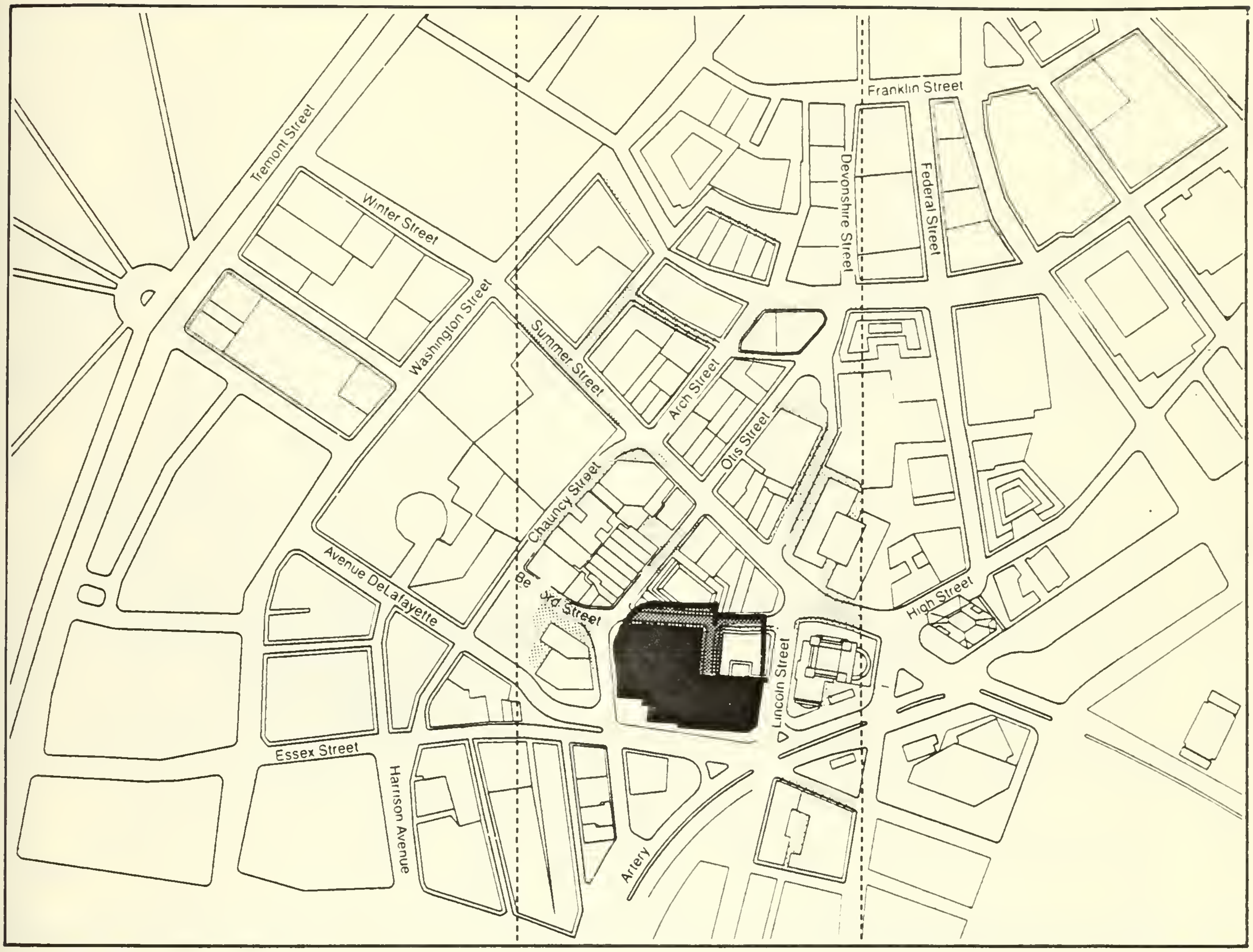
Shadow Study Area

Proposed Building Footprint

Kingston Bedford Essex Street Pro
BOSTON REDEVELOPMENT AUTHO

Ground Plane Shadow Studies

Figure IV E-49:
Shadow Studies Alternative 5 (June 22, Noon)



June 22 Noon-Alt. 6

Existing Shadows

Net New Shadows

Outline of Project Shadow

Shadow Study Area

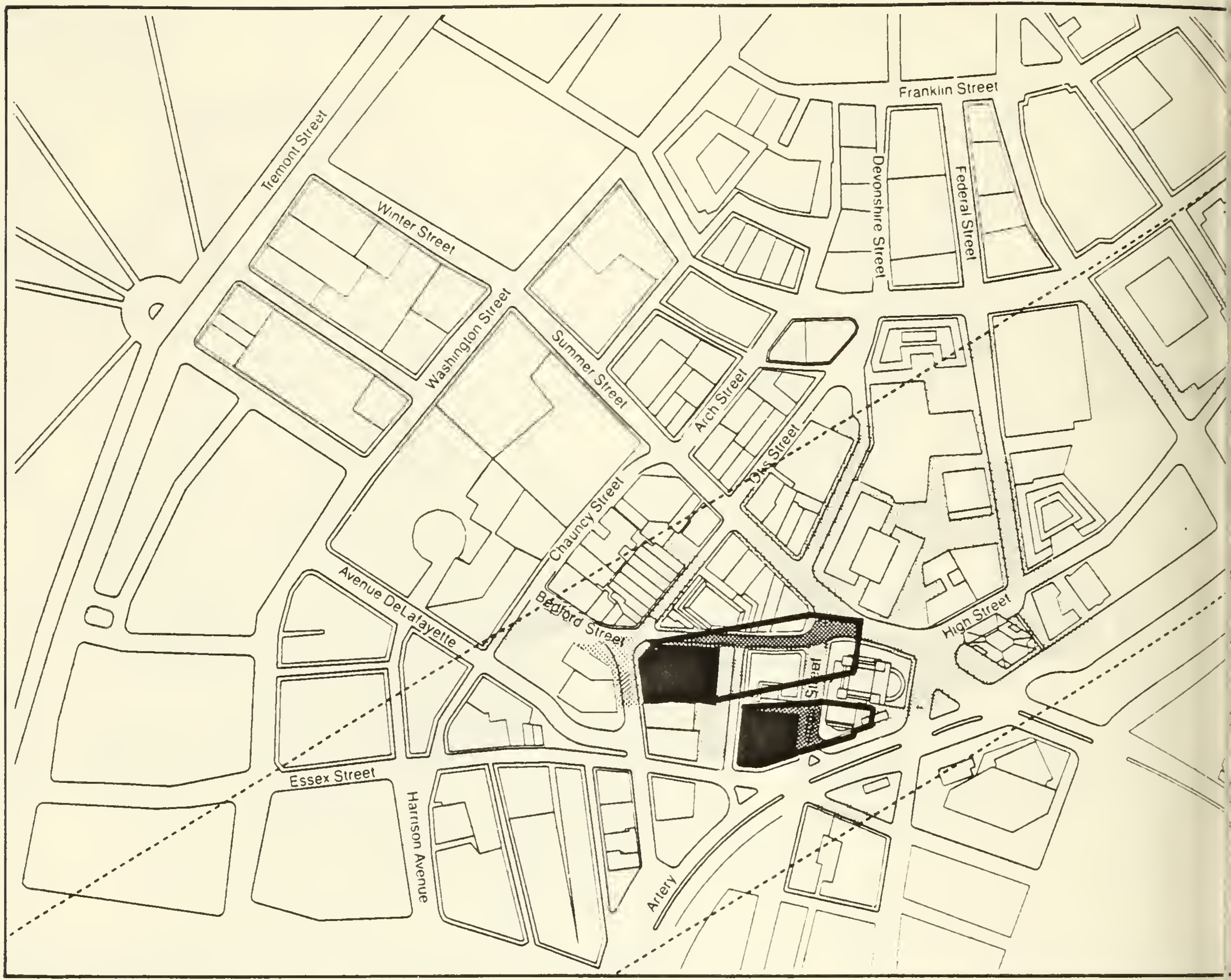
Proposed Building Footprint

Kingston Bedford Essex Street Project

BOSTON REDEVELOPMENT AUTHORITY

Ground Plane Shadow Studies

Figure IV E-50:
Shadow Studies Alternative 6 (June 22, Noon)



June 22 3pm-Alt. 2

Existing Shadows

Net New Shadows

Outline of Project Shadow

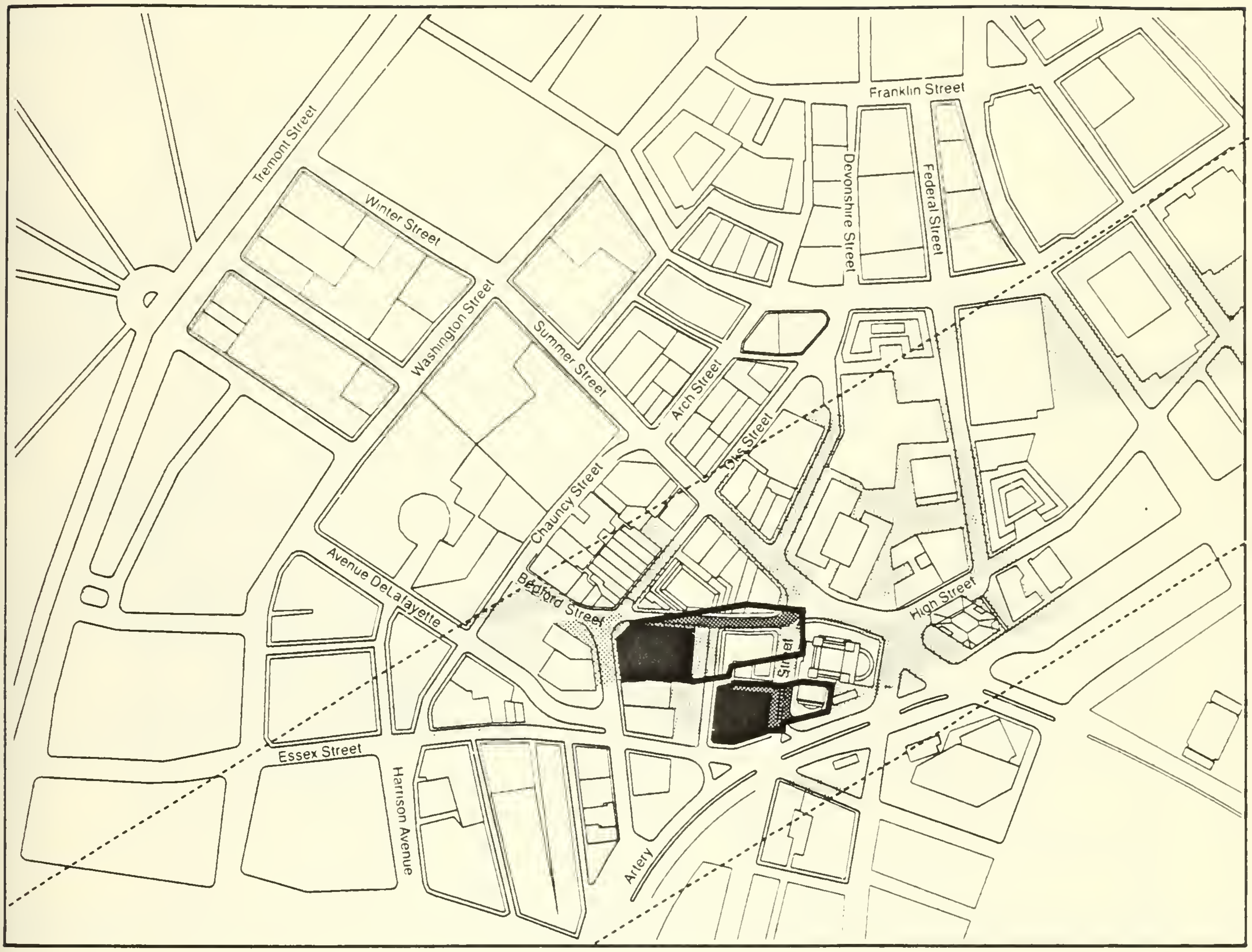
Shadow Study Area

Proposed Building Footprint

Kingston Bedford Essex Street Pro
BOSTON REDEVELOPMENT AUTHO

Ground Plane Shadow Studies

Figure IV E-51:
Shadow Studies Alternative 2 (June 22, 3 PM)



June 22 3pm-Alt. 3

Existing Shadows

Net New Shadows

Outline of Project Shadow

Shadow Study Area

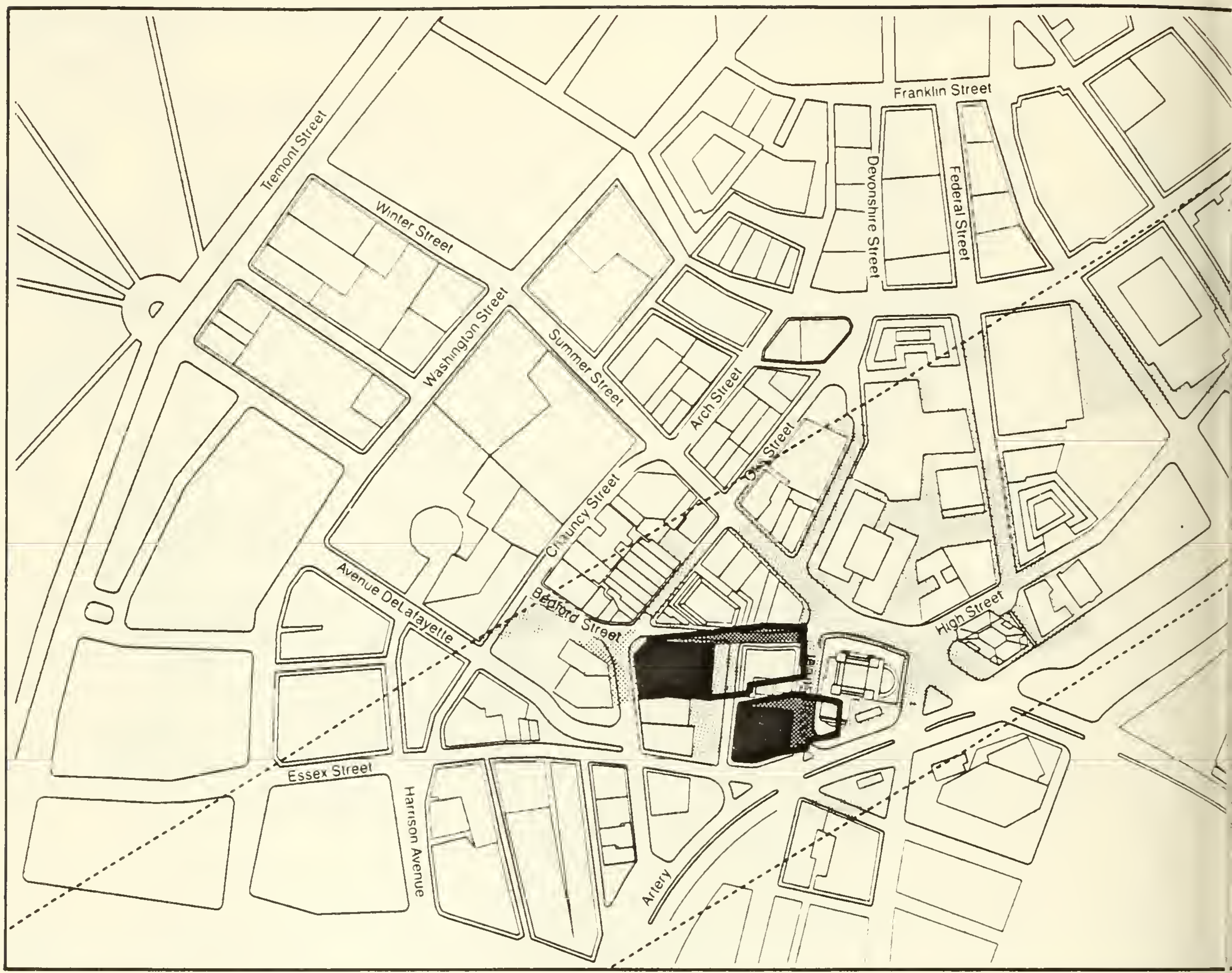
Proposed Building Footprint

Kingston Bedford Essex Street Project

BOSTON REDEVELOPMENT AUTHORITY

Ground Plane Shadow Studies

Figure IV E-52:
Shadow Studies Alternative 3 (June 22, 3 PM)



June 22 3pm-Alt. 4

Existing Shadows

Net New Shadows

Outline of Project Shadow

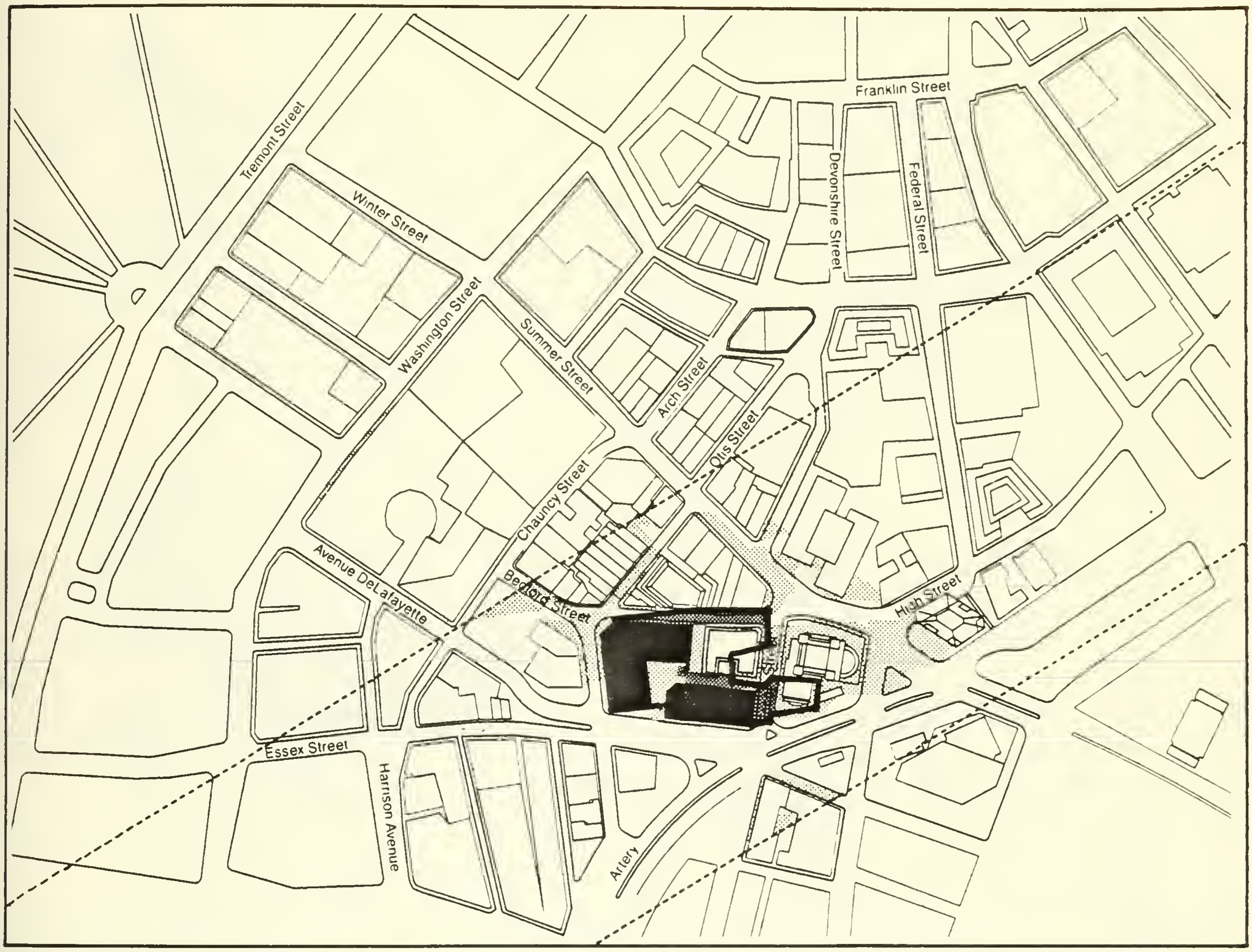
Shadow Study Area

Proposed Building Footprint

Kingston Bedford Essex Street Proj
BOSTON REDEVELOPMENT AUTHOR

Ground Plane Shadow Studies

Figure IV E-53:
Shadow Studies Alternative 4 (June 22, 3 PM)



June 22 3pm-Alt. 5

Existing Shadows

Net New Shadows

Outline of Project Shadow

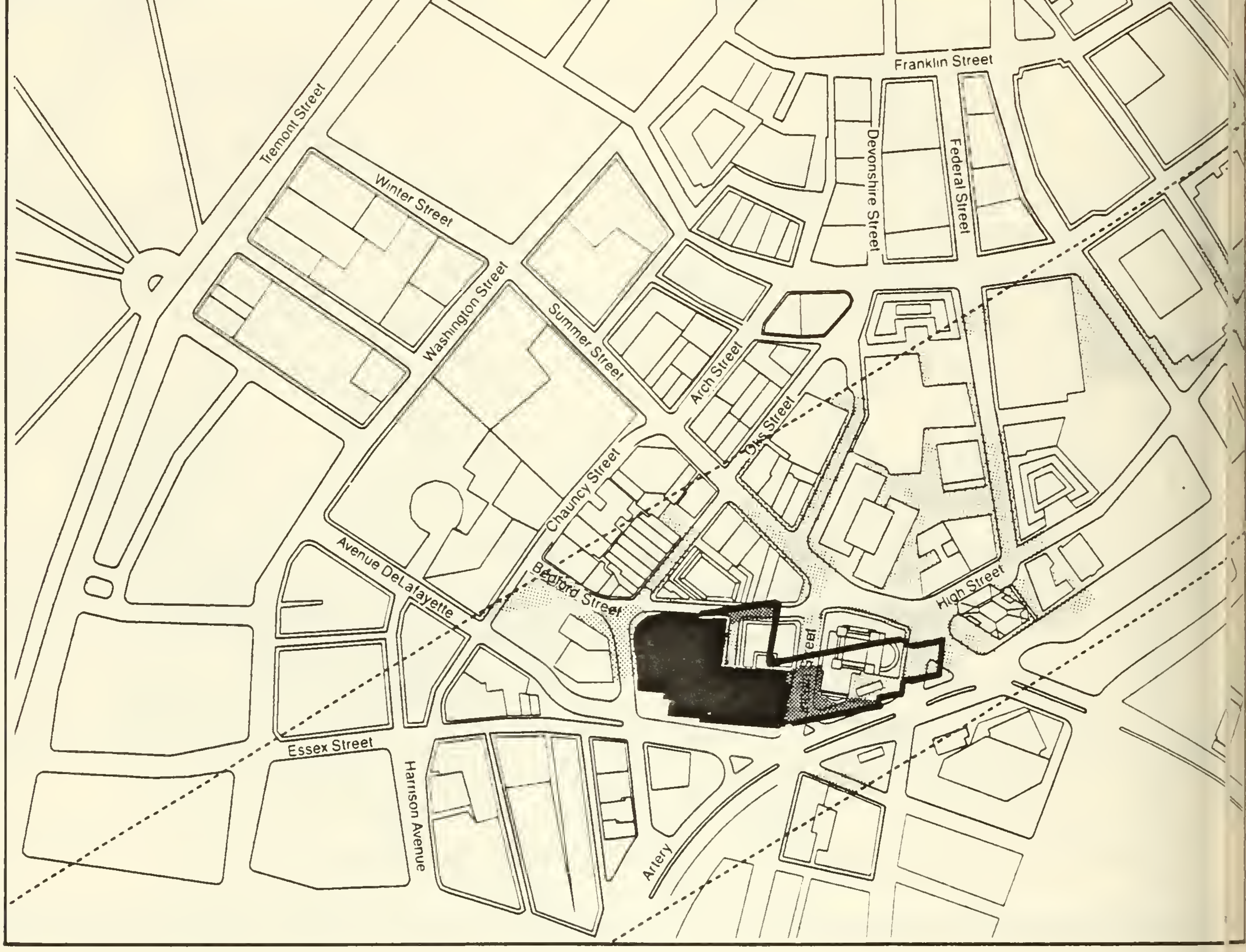
Shadow Study Area

Proposed Building Footprint

Kingston Bedford Essex Street Project
BOSTON REDEVELOPMENT AUTHORITY

Ground Plane Shadow Studies

Figure IV E-54:
Shadow Studies Alternative 5 (June 22, 3 PM)



June 22 3pm-Alt. 6

Existing Shadows

Net New Shadows

Outline of Project Shadow

Shadow Study Area

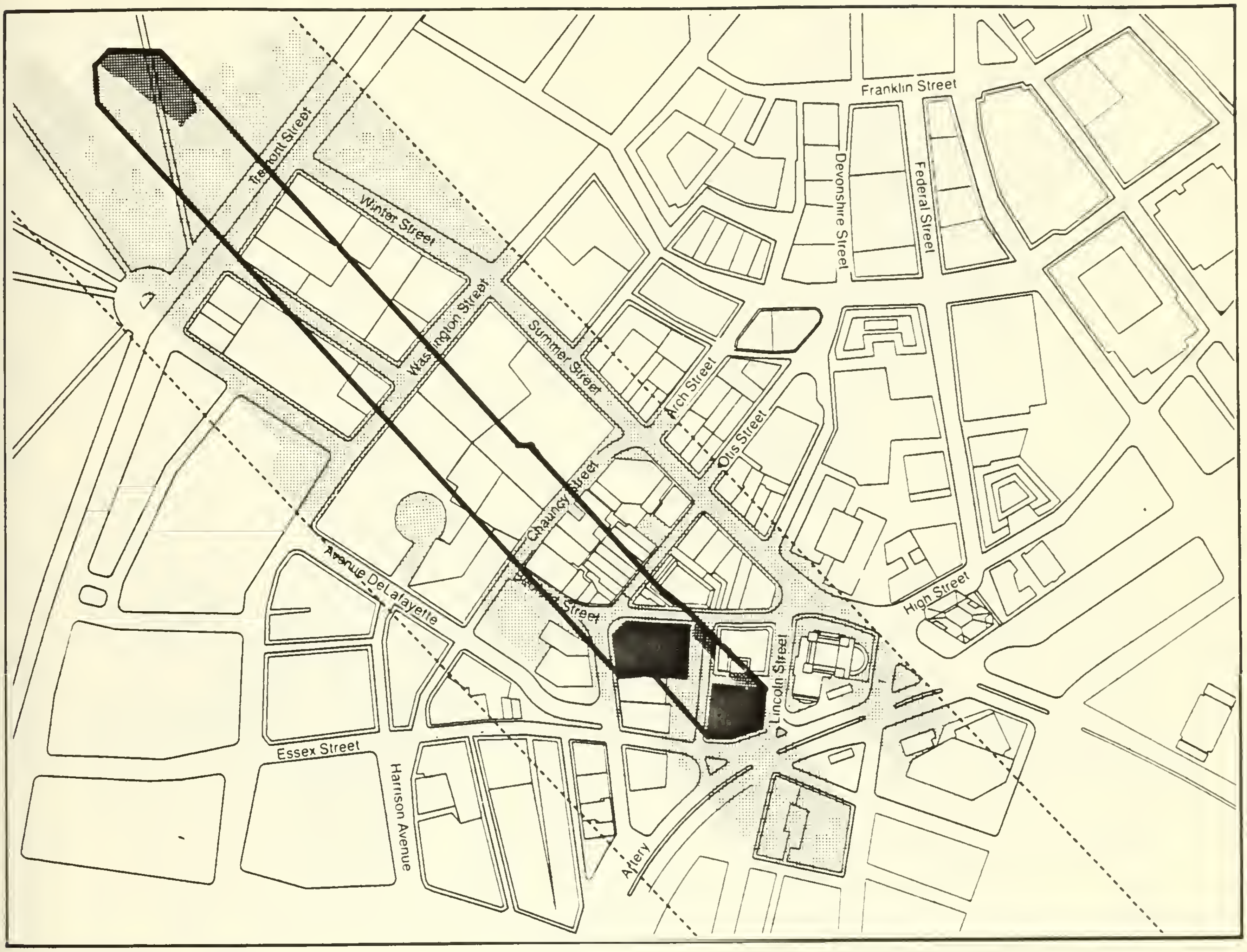
Proposed Building Footprint

Kingston Bedford Essex Street Project

BOSTON REDEVELOPMENT AUTHORITY

Ground Plane Shadow Studies

Figure IV E-55:
Shadow Studies Alternative 6 (June 22, 3 PM)



December 22 9am-Alt. 2

Existing Shadows

Net New Shadows

Outline of Project Shadow

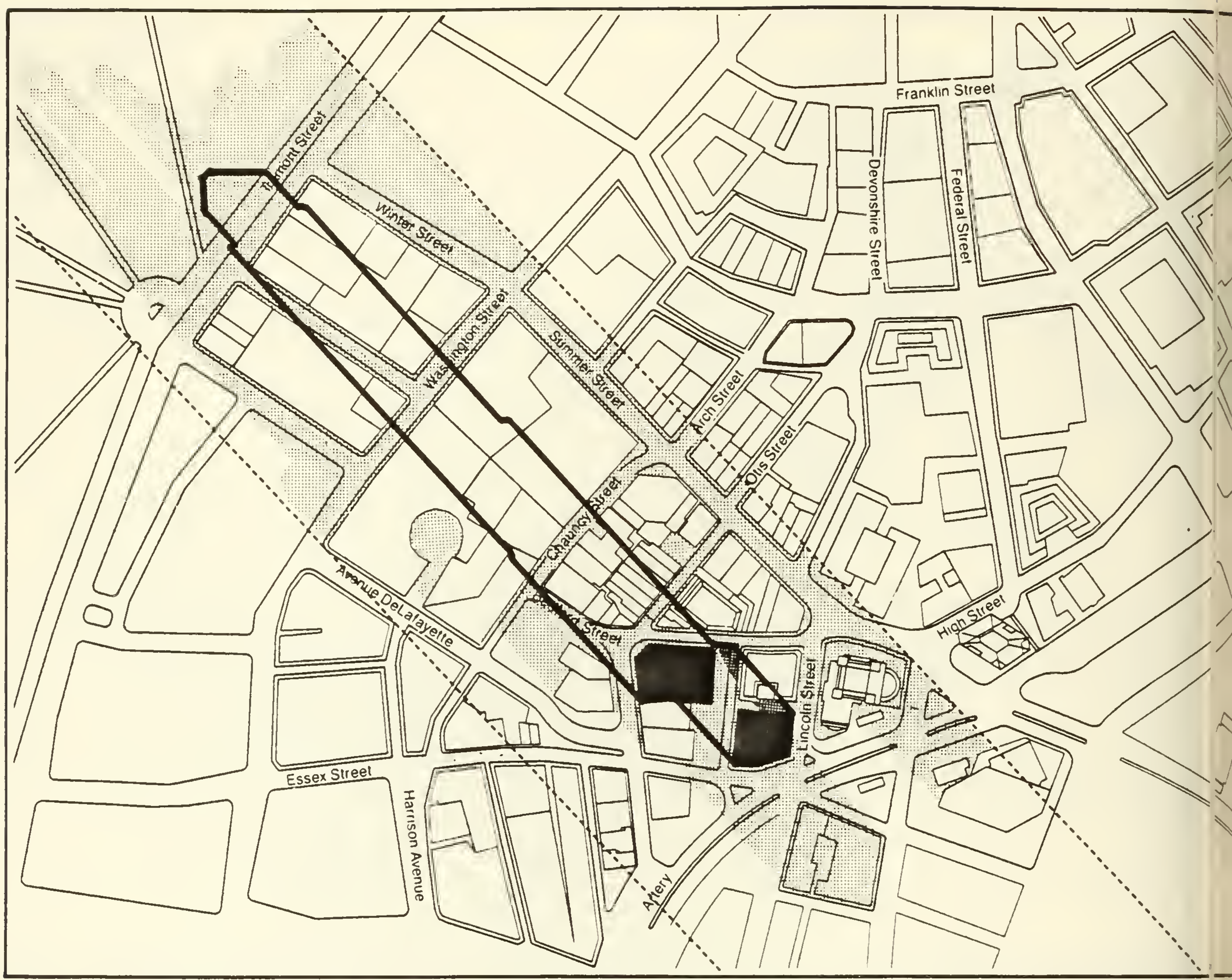
Shadow Study Area

Proposed Building Footprint

Kingston Bedford Essex Street Project
BOSTON REDEVELOPMENT AUTHORITY

Ground Plane Shadow Studies

Figure IV E-56:
Shadow Studies Alternative 2 (December 22, 9 AM)



December 22 9am-Alt. 3

Existing Shadows

Net New Shadows

Outline of Project Shadow

Shadow Study Area

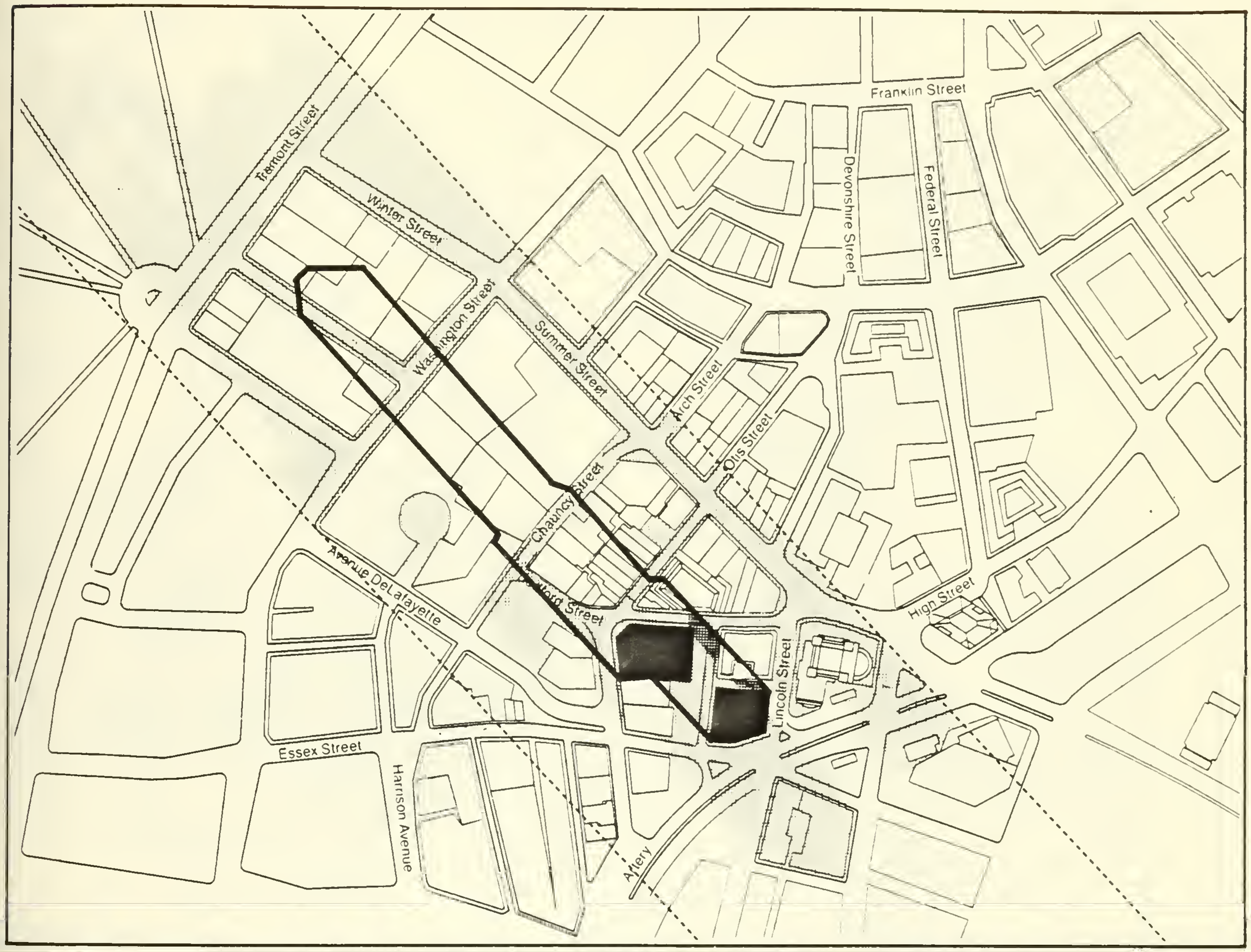
Proposed Building Footprint

Kingston Bedford Essex Street Pr[ec

BOSTON REDEVELOPMENT AUTHC[IT

Ground Plane Shadow Studies

Figure IV E-57:
Shadow Studies Alternative 3 (December 22, 9 AM)



December 22 9am-Alt. 4

Existing Shadows

Net New Shadows

Outline of Project Shadow

Shadow Study Area

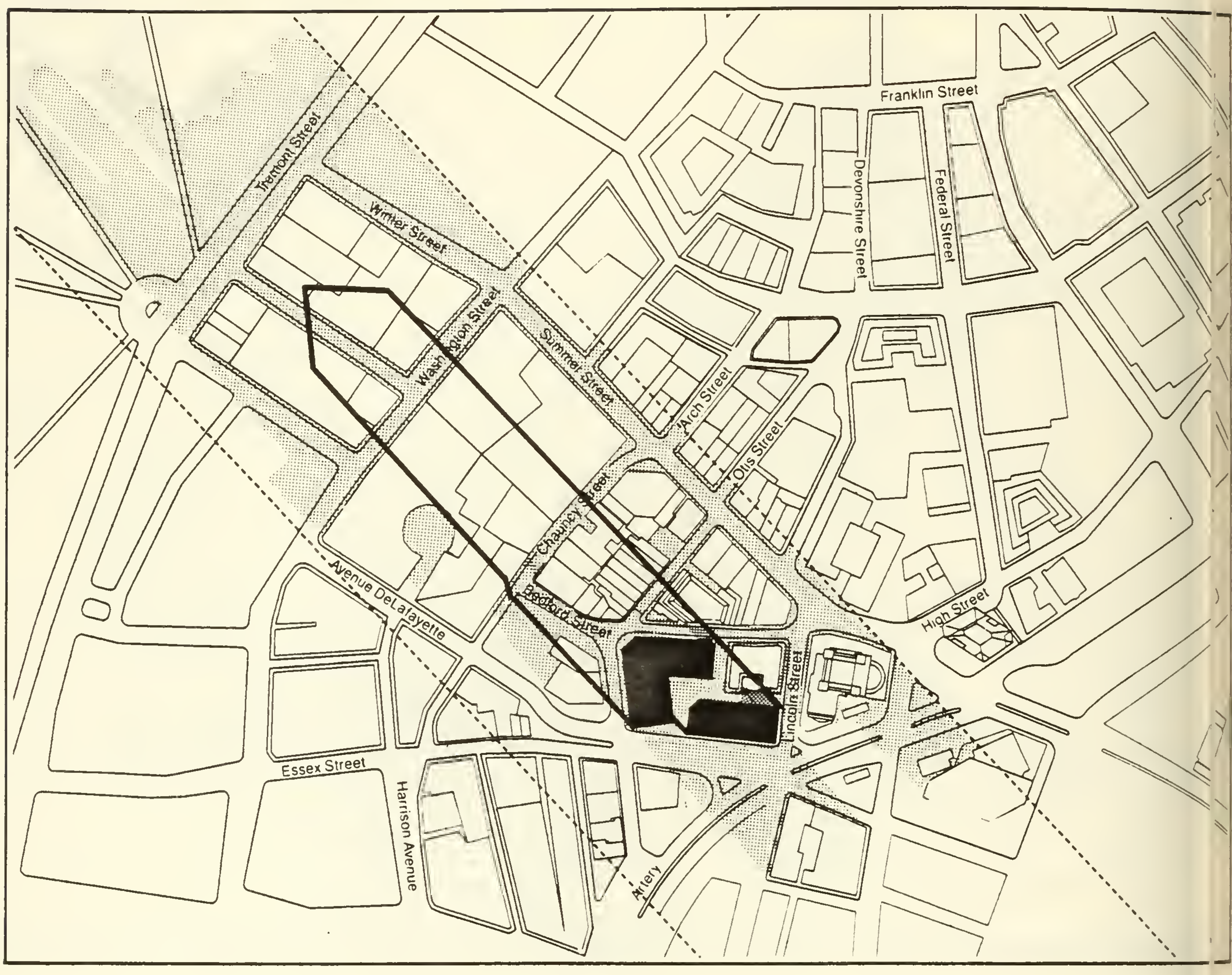
Proposed Building Footprint

Kingston Bedford Essex Street Project

BOSTON REDEVELOPMENT AUTHORITY

Ground Plane Shadow Studies

Figure IV E-58:
Shadow Studies Alternative 4 (December 22, 9 AM)



December 22 9am-Alt. 5

Existing Shadows

Net New Shadows

Outline of Project Shadow

Shadow Study Area

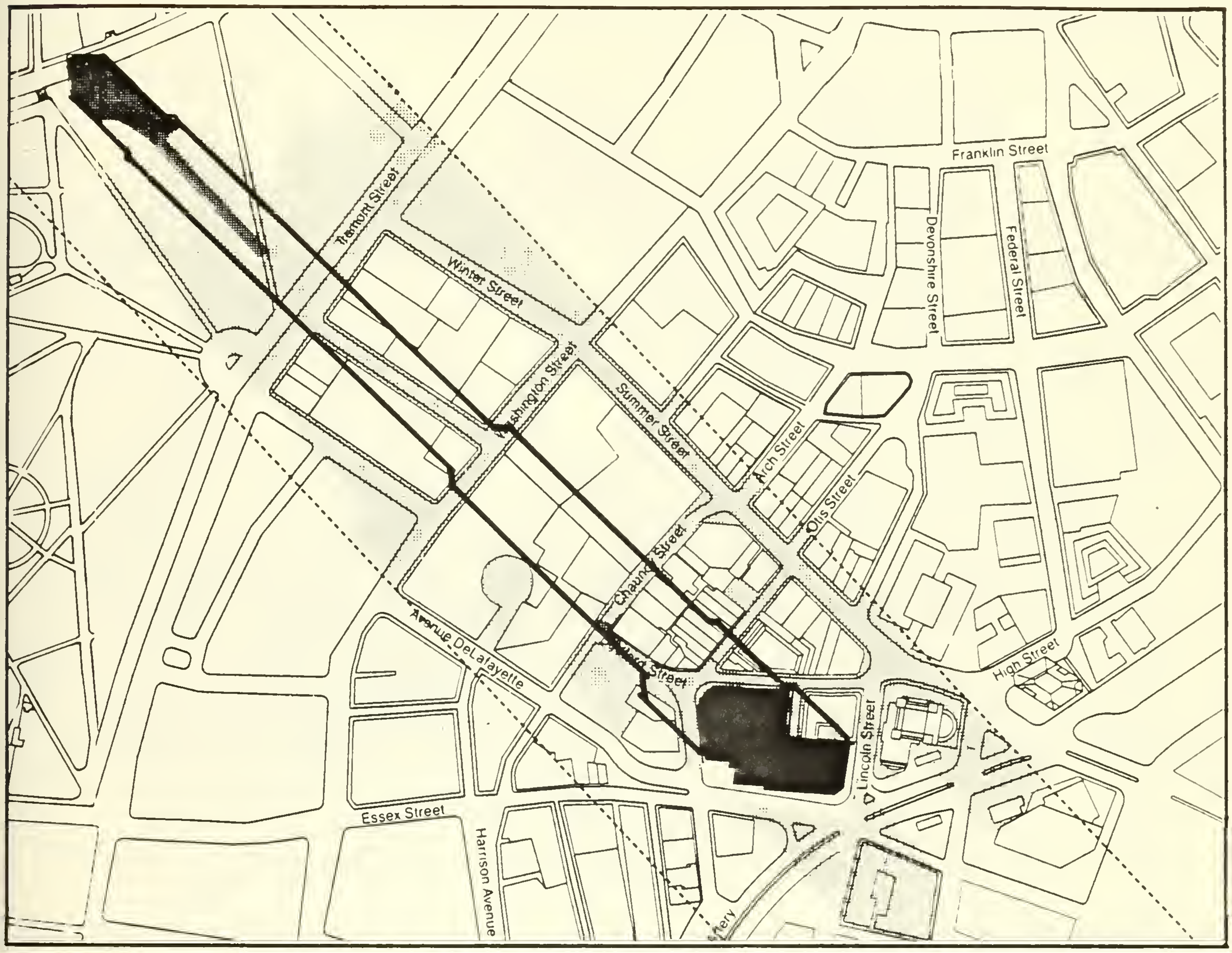
Proposed Building Footprint

Kingston Bedford Essex Street Proj ct

BOSTON REDEVELOPMENT AUTHOR Y

Ground Plane Shadow Studies

Figure IV E-59:
Shadow Studies Alternative 5 (December 22, 9 AM)



December 22 9am-Alt. 6

Existing Shadows

Net New Shadows

Outline of Project Shadow

Shadow Study Area

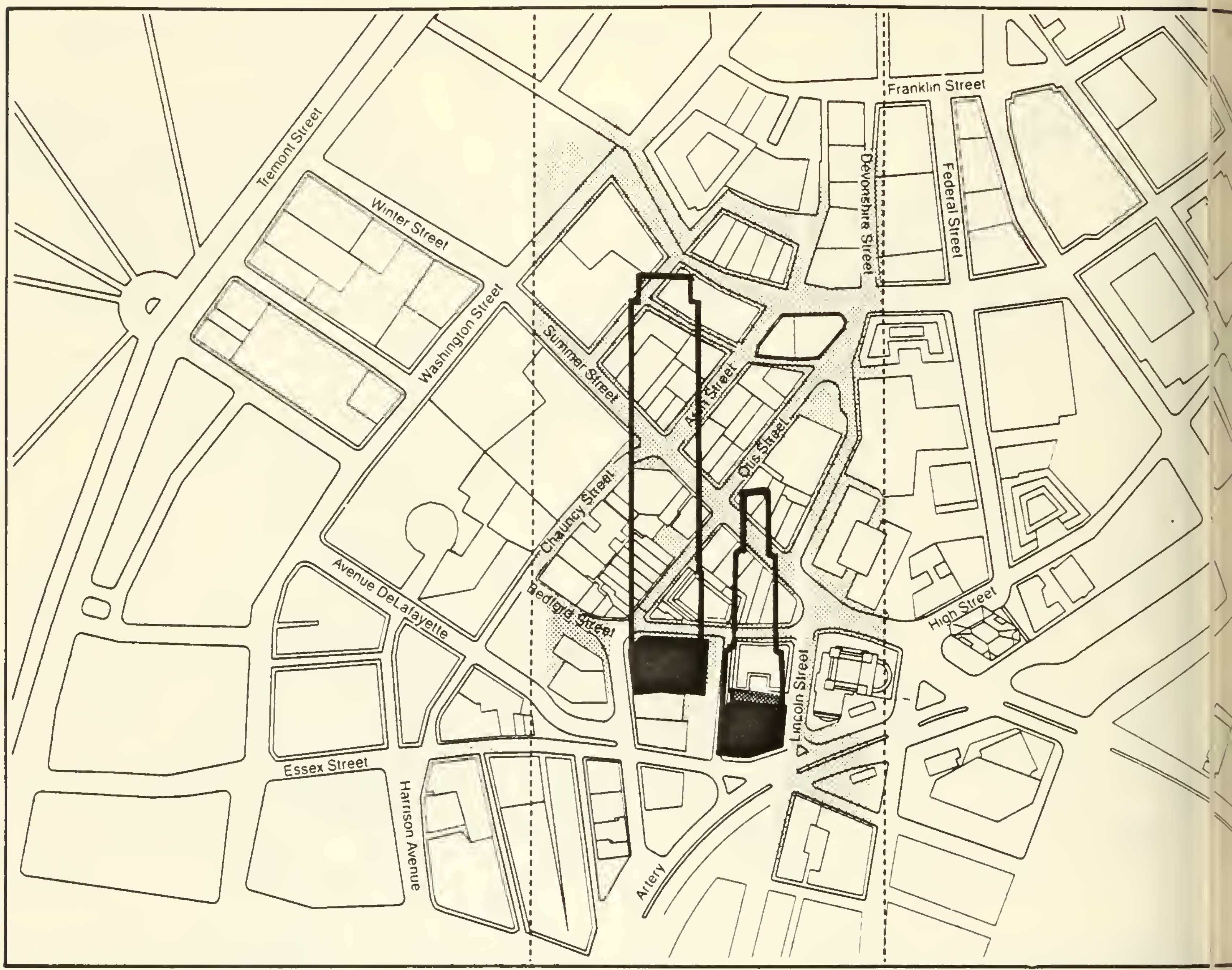
Proposed Building Footprint

Kingston Bedford Essex Street Project

BOSTON REDEVELOPMENT AUTHORITY

Ground Plane Shadow Studies

Figure IV E-60:
Shadow Studies Alternative 6 (December 22, 9 AM)



December 22 Noon-Alt. 2

Existing Shadows

Net New Shadows

Outline of Project Shadow

Shadow Study Area

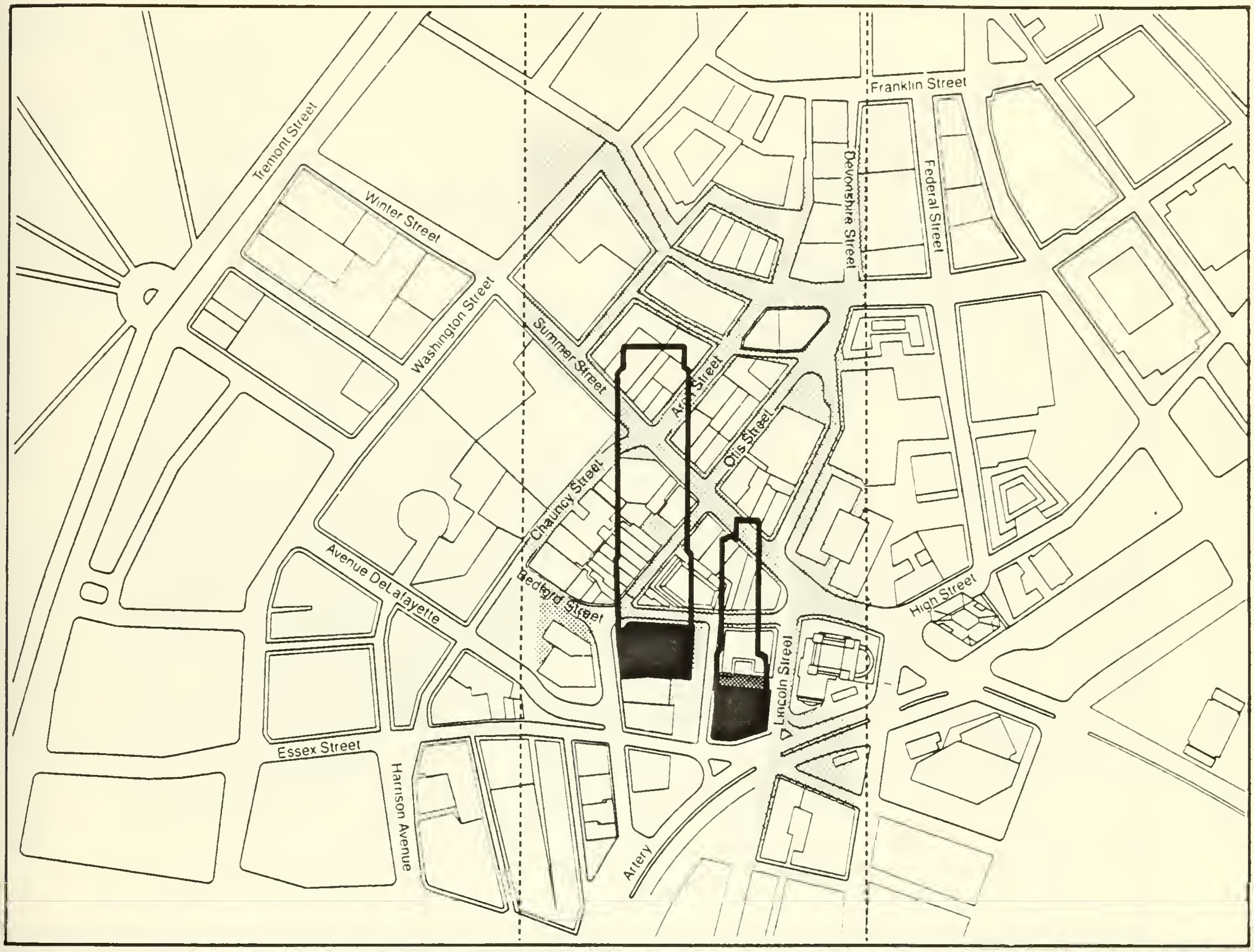
Proposed Building Footprint

Kingston Bedford Essex Street Pro

BOSTON REDEVELOPMENT AUTHO

Ground Plane Shadow Studies

Figure IV E-61:
Shadow Studies Alternative 2 (December 22, Noon)



December 22 Noon-Alt. 3

Existing Shadows

Net New Shadows

Outline of Project Shadow

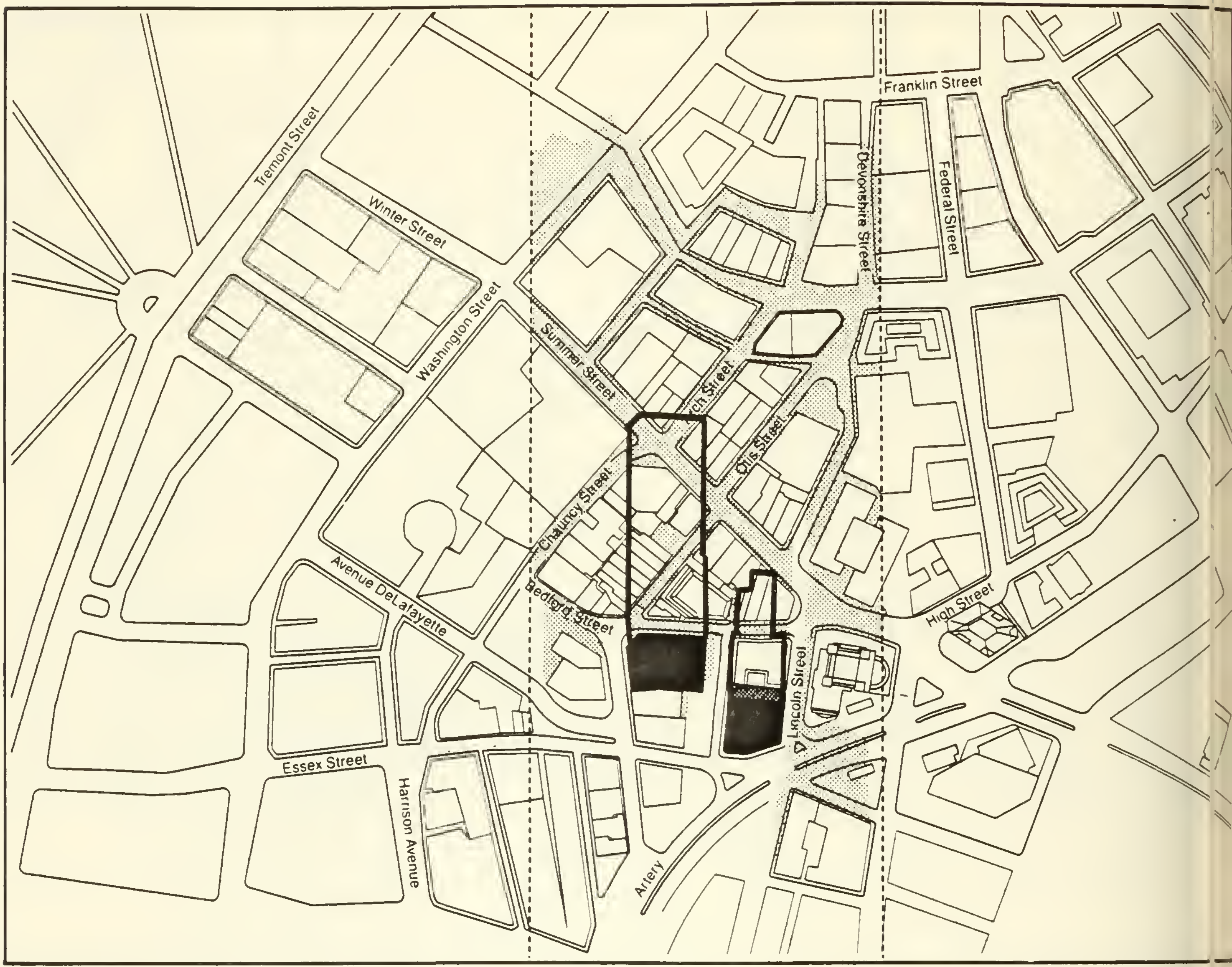
Shadow Study Area

Proposed Building Footprint

Kingston Bedford Essex Street Project
BOSTON REDEVELOPMENT AUTHORITY

Ground Plane Shadow Studies

Figure IV E-62:
Shadow Studies Alternative 3 (December 22, Noon)



December 22 Noon-Alt. 4

Existing Shadows

Net New Shadows

Outline of Project Shadow

Shadow Study Area

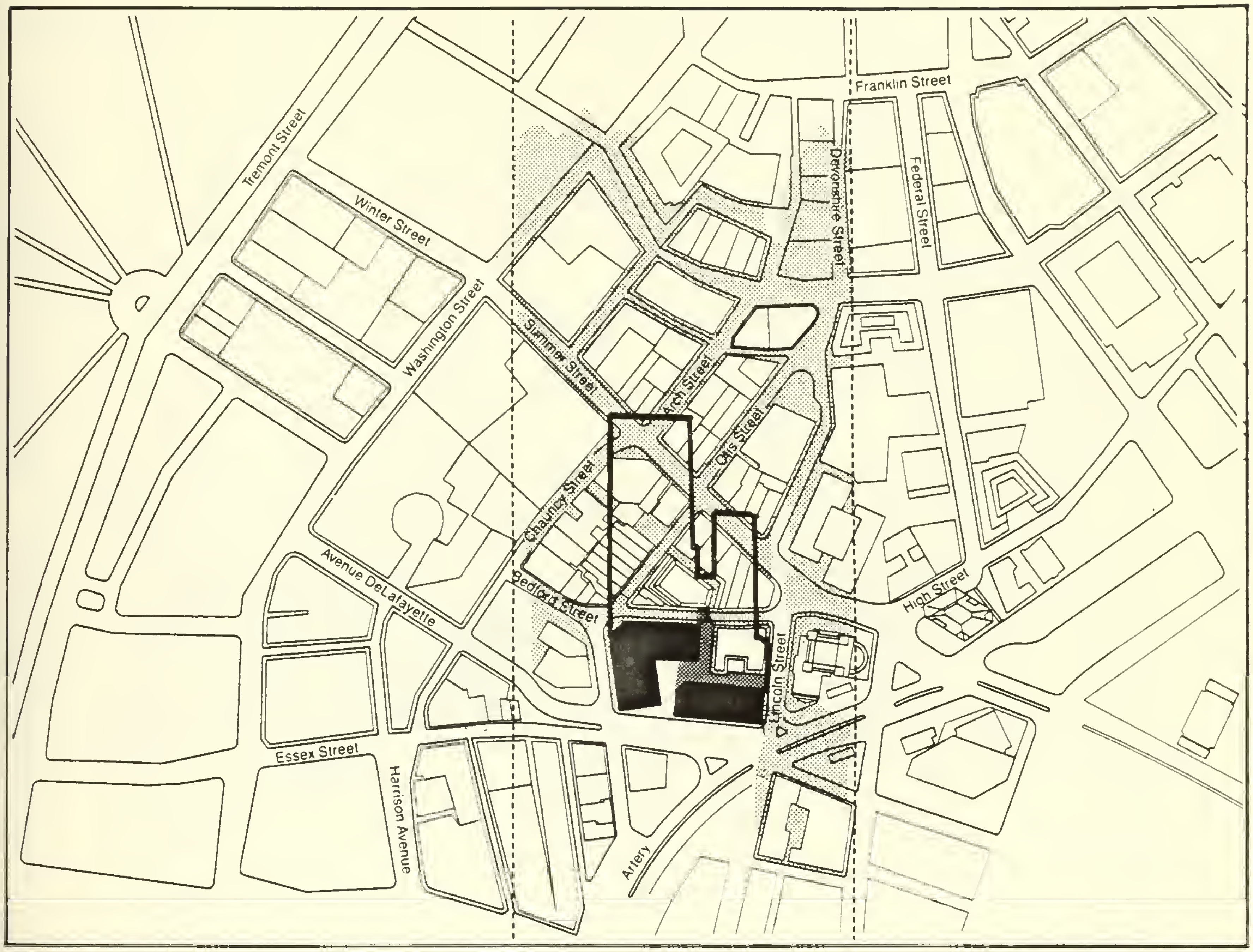
Proposed Building Footprint

Kingston Bedford Essex Street Pro

BOSTON REDEVELOPMENT AUTHO

Ground Plane Shadow Studies

Figure IV E-63:
Shadow Studies Alternative 4 (December 22, Noon)



December 22 Noon-Alt. 5

Existing Shadows

Net New Shadows

Outline of Project Shadow

Shadow Study Area

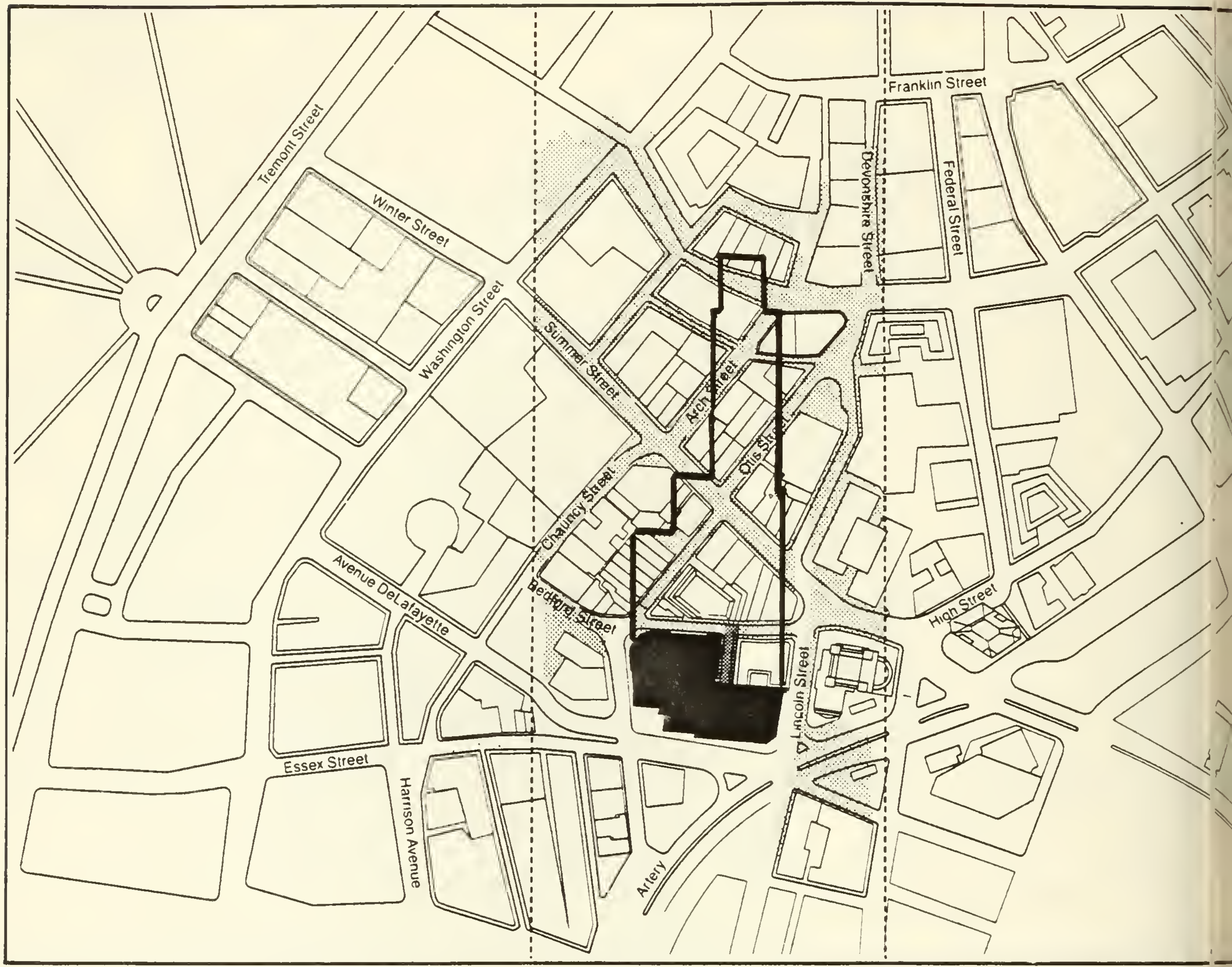
Proposed Building Footprint

Kingston Bedford Essex Street Project

BOSTON REDEVELOPMENT AUTHORITY

Ground Plane Shadow Studies

Figure IV E-64:
Shadow Studies Alternative 5 (December 22, Noon)



December 22 Noon-Alt. 6

Existing Shadows

Net New Shadows

Outline of Project Shadow

Shadow Study Area

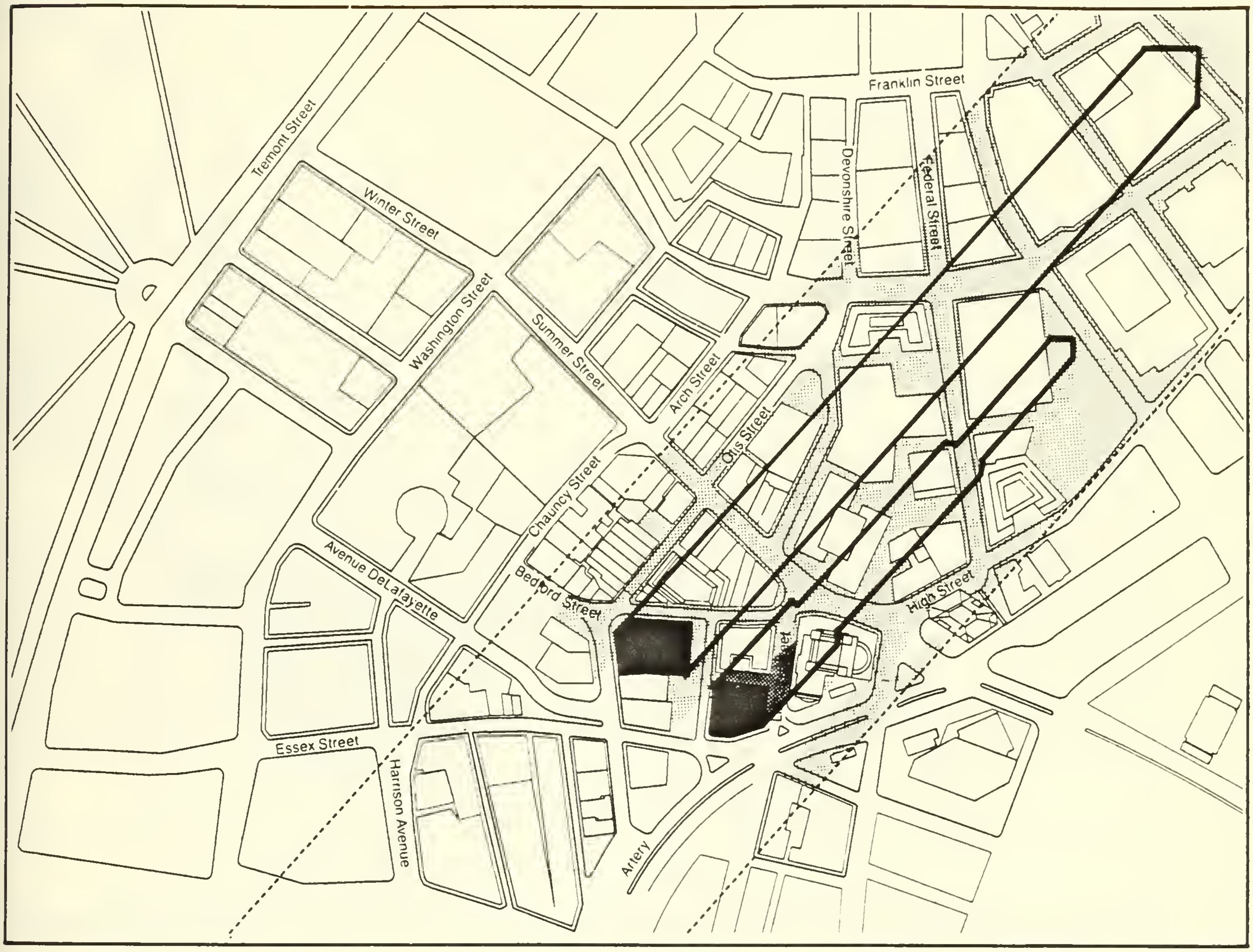
Proposed Building Footprint

Kingston Bedford Essex Street Pro

BOSTON REDEVELOPMENT AUTHO TY

Ground Plane Shadow Studies

Figure IV E-65:
Shadow Studies Alternative 6 (December 22, Noon)



December 22 3pm-Alt. 2

Existing Shadows

Net New Shadows

Outline of Project Shadow

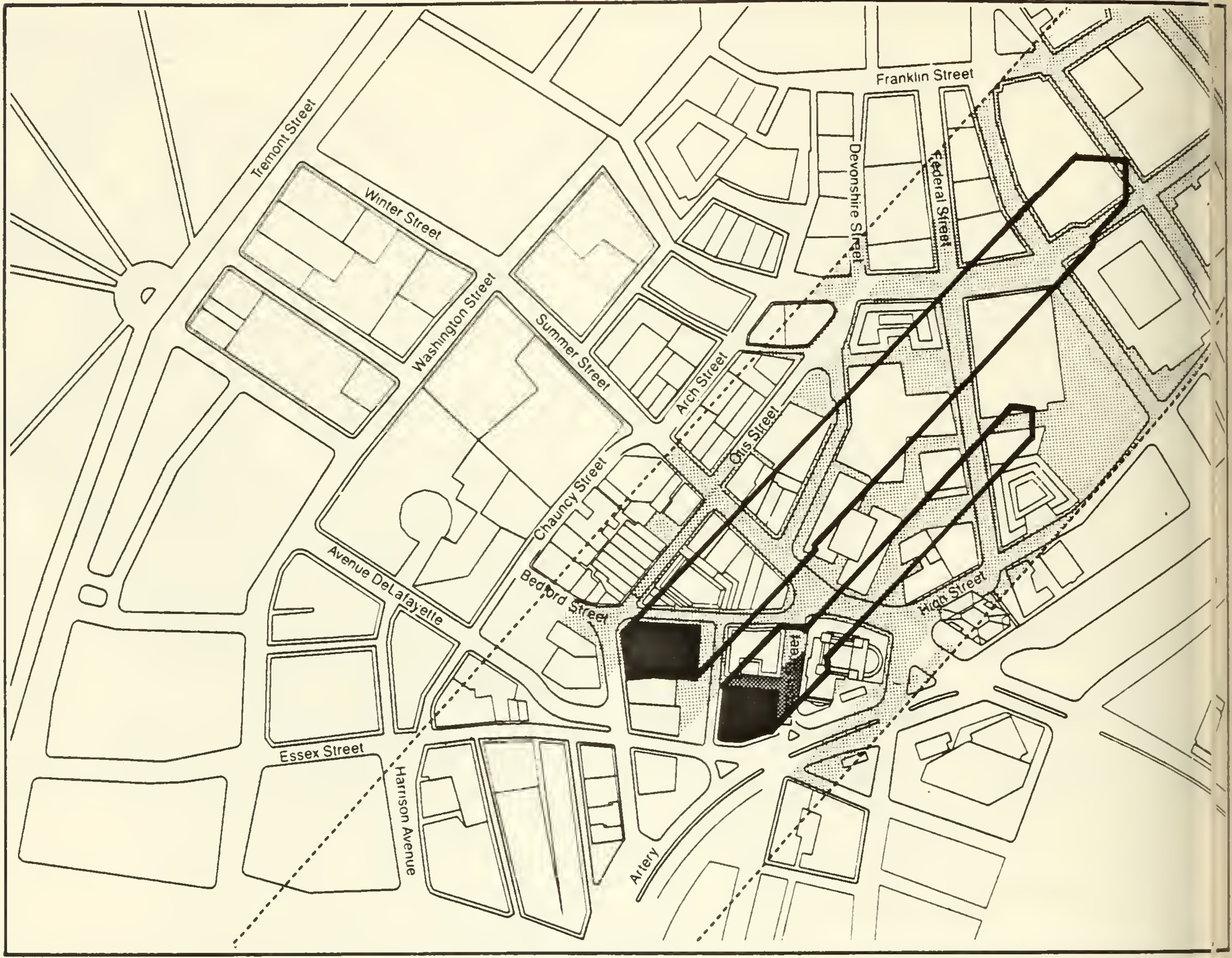
Shadow Study Area

Proposed Building Footprint

Kingston Bedford Essex Street Project
BOSTON REDEVELOPMENT AUTHORITY

Ground Plane Shadow Studies

Figure IV E-66:
Shadow Studies Alternative 2 (December 22, 3 PM)



December 22 3pm-Alt. 3

Existing Shadows

Net New Shadows

Outline of Project Shadow

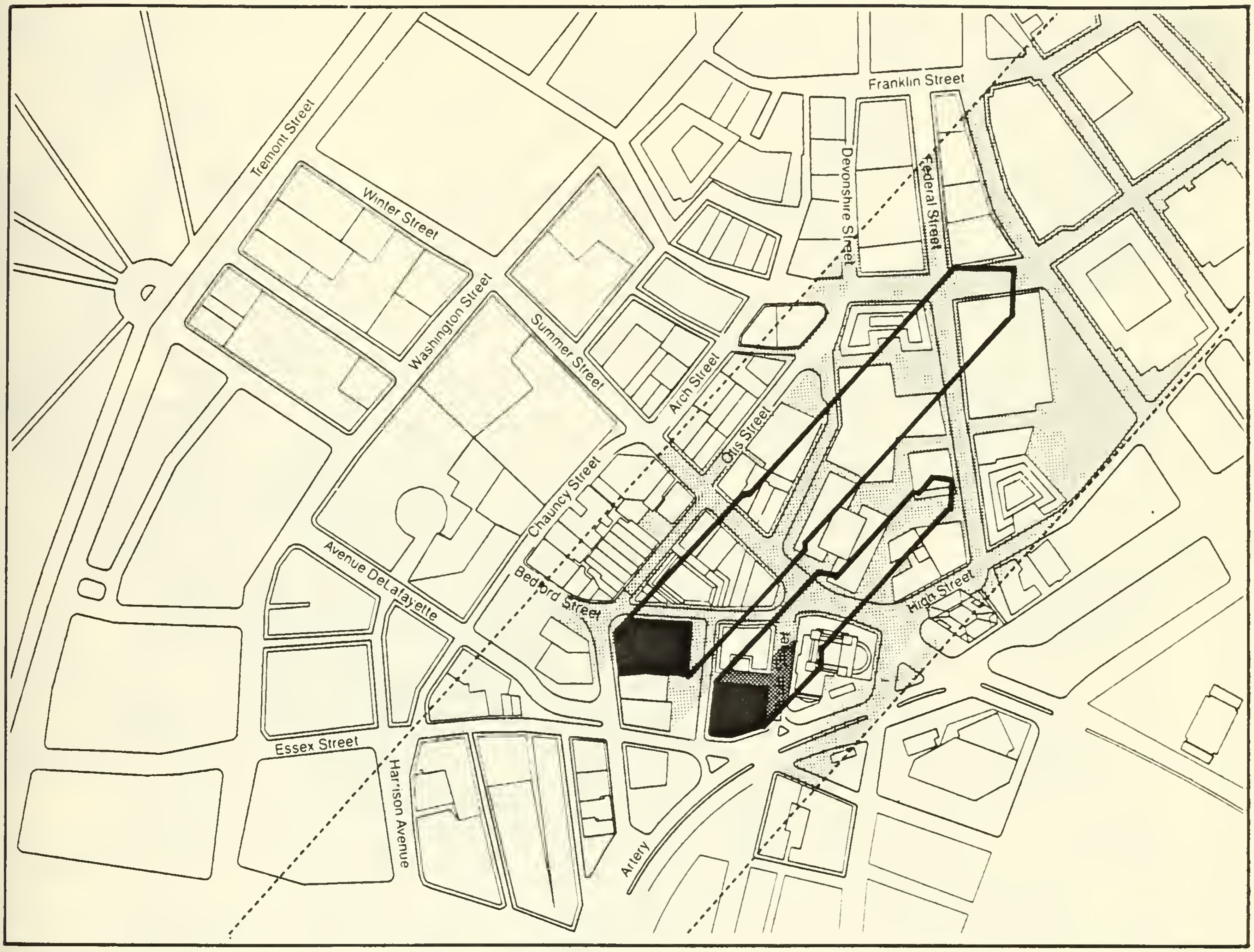
Shadow Study Area

Proposed Building Footprint

Kingston Bedford Essex Street Proj[ect]
BOSTON REDEVELOPMENT AUTHOR[ITY]

Ground Plane Shadow Studies

Figure IV E-67:
Shadow Studies Alternative 3 (December 22, 3 PM)



December 22 3pm-Alt. 4

Existing Shadows

Net New Shadows

Outline of Project Shadow

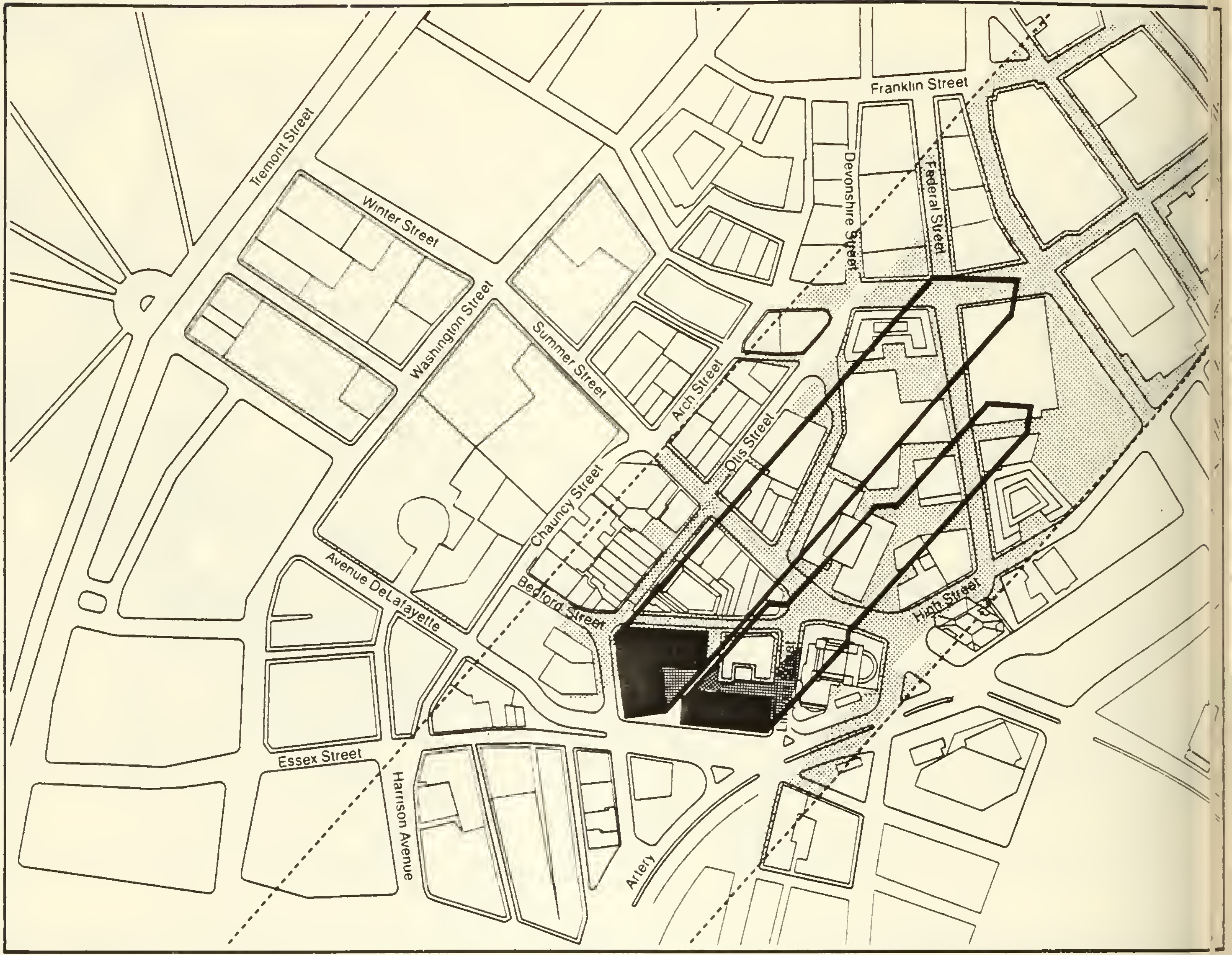
Shadow Study Area

Proposed Building Footprint

Kingston Bedford Essex Street Project
BOSTON REDEVELOPMENT AUTHORITY

Ground Plane Shadow Studies

Figure IV E-68:
Shadow Studies Alternative 4 (December 22, 3 PM)



December 22 3pm-Alt. 5

Existing Shadows

Net New Shadows

Outline of Project Shadow

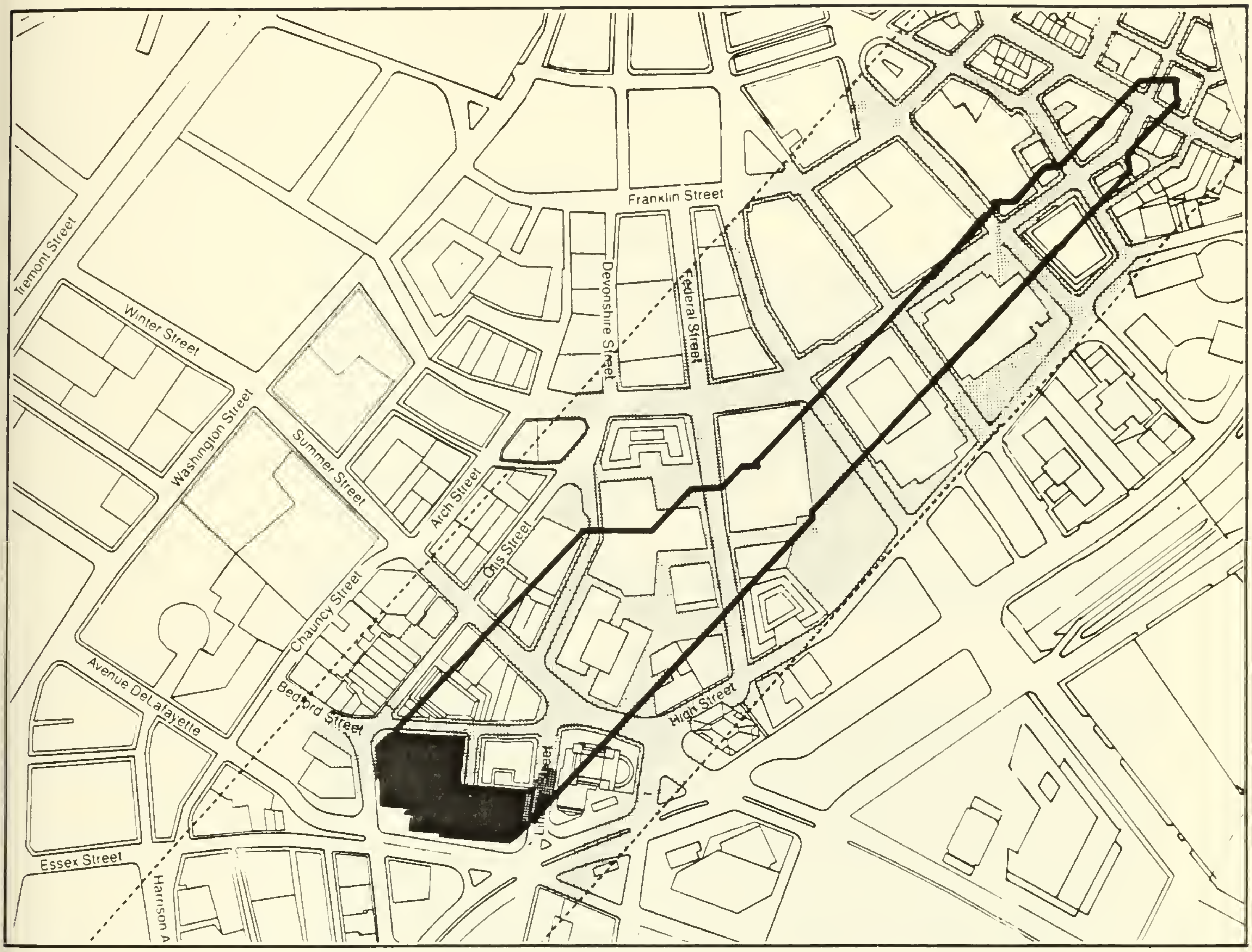
Shadow Study Area

Proposed Building Footprint

Kingston Bedford Essex Street Proj
BOSTON REDEVELOPMENT AUTHOR

Ground Plane Shadow Studies

Figure IV E-69:
Shadow Studies Alternative 5 (December 22, 3 PM)



December 22 3pm-Alt. 6

Existing Shadows

Net New Shadows

Outline of Project Shadow

Shadow Study Area

Proposed Building Footprint

Kingston Bedford Essex Street Project
BOSTON REDEVELOPMENT AUTHORITY

Ground Plane Shadow Studies

Figure IV E-70:
Shadow Studies Alternative 6 (December 22, 3 PM)

F. AERONAUTICS

Description of the Environment

The project site is located in downtown Boston between Chinatown and the Financial District. While buildings in Chinatown and the neighboring Leather District consist of five- to six-story brick structures, buildings in the Financial District consist of mid- to high-rise structures ranging in height up to 500 feet. Nearby buildings, such as the 99 Summer Street office building with its 20 stories, the 45-story One Financial Center, and the 23-story 125 Summer Street office building, are typical of the buildings in the immediate vicinity of the site. The five build alternatives range in height from 240 feet to 465 feet, reflecting a transition for the proposed development between the highrise buildings north of the project site and the lower buildings south of the site.

The MEPA Certificate of the Scope (August 8, 1986) indicated that the project site is located within the flight path of helicopters. Consideration is therefore to be given to the potential impacts of the proposed project on the helicopter flight path.

Probable Impacts of the Alternatives

The most significant building characteristic affecting helicopter flight paths is building height. The tallest of the existing buildings in the vicinity of the project site rise to a height of approximately 500 feet. These buildings are 35 feet taller than the tallest building proposed by any of the alternatives being considered. Consequently, the buildings proposed for Alternative 6, the Developer's Proposal, or any of the other build alternatives are not likely to have a significant negative impact on existing helicopter flight paths in the vicinity of the site or to interfere with any proposed flight paths or heliport sites. The buildings proposed for the various alternatives are graphically depicted in Figures IV E-8 to IV E-12 for height comparison with existing buildings in the project site area. As shown in these diagrams, all of the alternatives consist of buildings that are shorter than the tallest buildings in the immediate vicinity of the site.

Mitigation Measures

To ensure the project does not adversely impact helicopter flight paths, the final development plans should be reviewed for compatibility with the Massachusetts Aeronautics Commission.

G. WIND

Introduction

This section presents the results of a qualitative analysis of wind conditions at the pedestrian level. Each development alternative was considered separately. The main objectives of the analysis were:

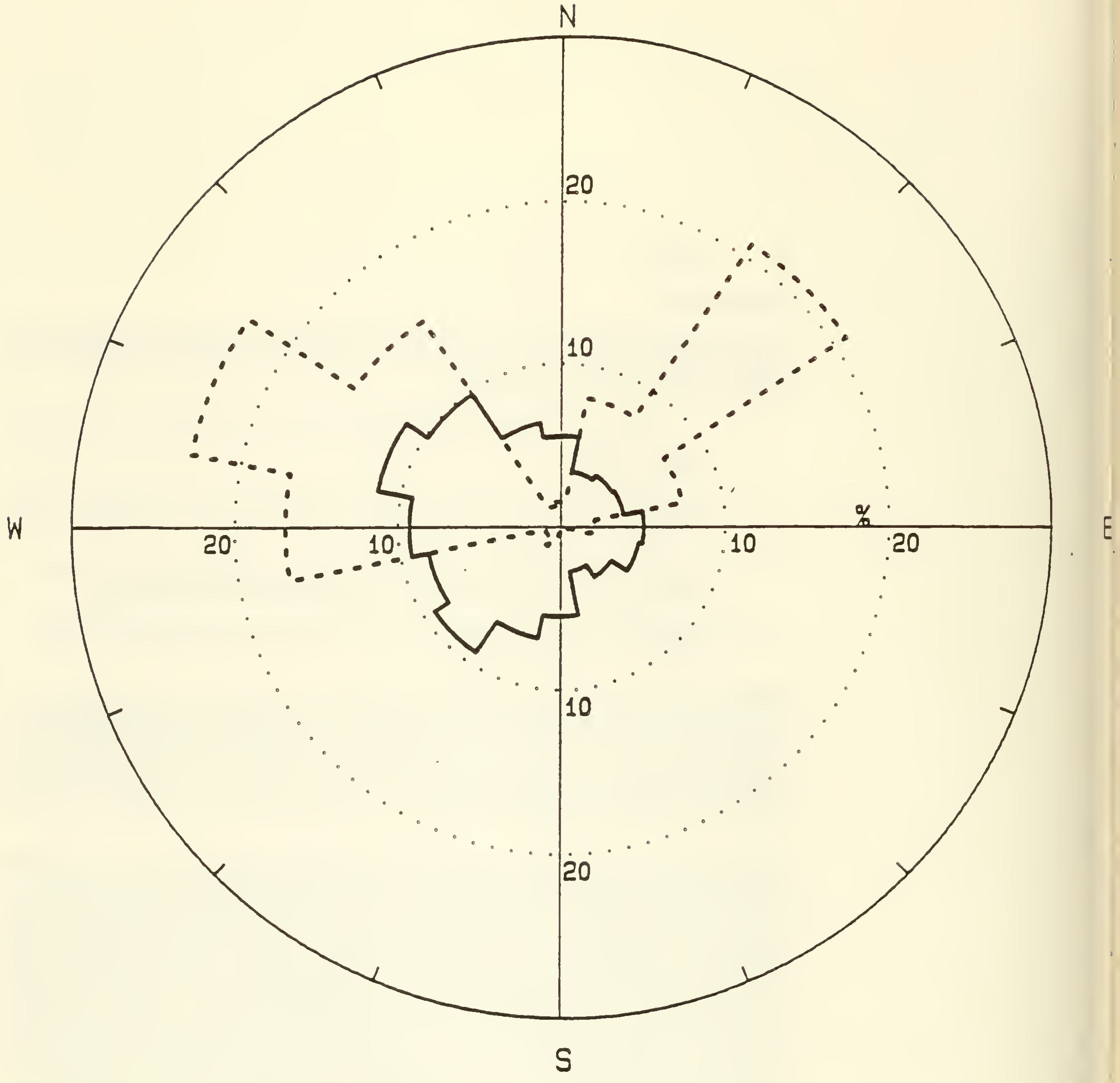
- to qualitatively describe the pedestrian level wind environment for the no-build condition;
- to determine the impact that the five build alternatives would have on the current no-build wind environment;
- to qualitatively compare the pedestrian level wind climate around each development alternative to other development alternatives; and
- to identify pedestrian areas where the development alternatives could cause uncomfortable winds.

The interaction of wind with buildings in developed areas can be very complex and is best determined through wind tunnel tests, especially if quantitative information is required. However, useful qualitative information can be obtained from knowledge of the aerodynamics of buildings, past experience with wind tunnel tests, and numerical modeling of the local wind environment. The present assessment has used this qualitative approach.

The consideration of wind in planning outdoor activity areas is important because high winds in an area tend to deter pedestrian use. For example, in sensitive areas such as outdoor cafes where people would be sitting, the winds should be calm. For bus stops and other locations where people would be standing, somewhat higher winds can be tolerated. For frequently used sidewalks, where people are primarily walking, stronger winds are acceptable, and for infrequently used areas, the wind comfort criteria can be relaxed even further. The actual effects of wind can change from inconvenience, due to the pick-up of dust and other loose material in a moderate breeze, to severe difficultly with walking due to the wind forces on the pedestrian. The old and infirm are more susceptible to adverse wind effects than the young and the healthy. Wind chill is an additional concern in the winter months and requires somewhat stricter comfort criteria.

Meteorological Data

Hourly wind records from Logan Airport for the entire year were analyzed to determine a correlation between wind speed and direction. The results of this analysis can be expressed in terms of gradient winds and are summarized in Figure IV G-1. Gradient winds are typically 2000 feet above the ground. The solid line in Figure IV G-1 shows the frequency of occurrence of a given wind direction when all winds are considered (0 mph). This curve shows that the winds from the west-northwest (11%), northwest (10%), west (9%), and southwest (9%) are the prevailing winds. When only gradient winds above 53 mph are considered in the analysis, winds from the west through northwest (55%) and from the north-northeast through east-northeast (36%) occur most often. It should be noted that a 53 mph gradient speed will occur approximately once per month in the Boston area.



BOSTON MASS. ANNUAL WINDS AT GRADIENT HEIGHT

——— > 0 mph (ALL WINDS)

- - - - - - - > 53 mph (1 EVENT PER MONTH)

· · · · · · · FREQUENCY OF OCCURRENCE IN %

TICK MARKS INDICATE FROM WHERE THE WIND IS DIRECTED
FREQUENCIES ARE FOR 22.5 DEGREE SECTORS OF THE COMPASS

Figure IV G-1:
Directional Distribution of Gradient Winds

From the above analysis, it is evident that the strongest winds, those affecting pedestrian wind comfort, would occur from the northwesterly or northeasterly directions. Southwest quadrant winds also occur frequently but are generally associated with slower wind speeds and therefore are less likely to result in uncomfortable wind conditions.

Pedestrian Wind Comfort

The BRA has established two standards for assessing the relative wind comfort of pedestrians. First, the BRA wind design guidance criteria states that an effective gust velocity (calculated as: mean hourly wind speed + 1.5 root-mean-square wind speed) which occurs more than one percent of the time should be less than or equal to 31 mph. The second set of criteria used by the BRA to determine the acceptability of specific locations is best known as Melbourne's criteria. These internationally accepted criteria are used to determine the relative level of pedestrian wind comfort based on activities such as walking, standing, or sitting. The criteria are generally expressed as follows:

	Mean Wind Speed (mph) for a 1% Probability
Dangerous Conditions	>27 mph
Uncomfortable for Walking	>19 but ≤ 27 mph
Comfortable for Walking	>15 but ≤ 19 mph
Comfortable for Standing	>12 but ≤ 15 mph
Comfortable for Sitting	≤ 12 mph

The wind climate found in a typical urban setting in Boston is generally comfortable for sidewalks and pedestrian thoroughfares, but without any mitigating measures, it is often uncomfortable for more passive pedestrian activities such as sitting.

Although it is difficult to determine the relative wind comfort levels around a complex downtown site using qualitative methods, areas that have the potential to be uncomfortable for walking activities can be identified. These opinions are supplemented by quantitative information available in the FEIA for 125 Summer Street. Therefore, this study will endeavour to approximate the wind comfort level in the key pedestrian areas for each build alternative.

General Principals of Wind Flow

Wind flows, estimated to occur around each development alternative, have been examined for eight (8) wind directions in 45 degree increments starting from true north. The sketches of the wind flow patterns have been included in Figures IV G-3 to IV G-26. The length of the arrows, which designate wind flow activity, can be roughly translated to anticipated wind strength. For example, a large arrow is representative of accelerated winds occurring in a particular area. These high wind speed zones are also highlighted by the shaded areas on each sketch. The high wind speeds are typically the result of strong upper level winds being deflected down to grade by high-rise buildings and accelerating at the pedestrian level. Short arrows, showing random flow directions, are representative of slow gusty wind conditions found in sheltered regions on the downwind side of the building.

Under ideal urban conditions, the winds at the pedestrian level are slowed by obstructions such as buildings, landscaping, fences, and steep grade changes. However, as the height above the grade is increased, the number of obstructions to the wind will decrease. With fewer obstructions, the winds are allowed to flow more freely. Therefore, faster flowing winds are found higher above the ground. When a tall building or a building which extends above the height of surrounding buildings is placed in the path of the wind, these faster flowing upper level winds are blocked by the building. While some of this wind is deflected over the top or around the edges of the building, most of it is deflected down the windward face of the building to the pedestrian level. This wind action is one of the most common causes of uncomfortable wind conditions at the base of buildings. Wind speeds on the windward side of a building, and particularly at the building corners, can often be 2 to 3 times faster than winds in other areas around a building.

The magnitude of the wind speed increases experienced at the base of a building can be influenced by a number of factors. Generally, the wider the windward facade of the building which is perpendicular to the wind, the greater the obstruction, and hence the greater the potential for accelerated winds to be deflected down to the pedestrian level. Similarly, as the height of a building is increased, the windward face of the building is exposed to even faster flowing wind which can potentially be deflected down to pedestrian level. The funnelling of winds between two buildings or through an open passage cut through a tall building will result in accelerated winds being concentrated in a small area. This can often result in significant wind speed increases at pedestrian level.

Appendix E illustrates typical causes of uncomfortable or high wind speeds and the wind flow activity that can occur around a development site. Also shown in this Appendix are mitigation measures which can improve wind flow conditions. Typically, mitigating measures employ landscaping, podiums, canopies, or building step-backs to disrupt winds deflected down the windward side of a building and to prevent the downwashed winds from impacting directly on pedestrians. Other methods of controlling pedestrian level winds involve placing low level landscaping or architectural wind screens upwind of key pedestrian areas to provide local areas of reduced wind velocity.

Assessment of the Alternatives

The following alternatives were considered during this assessment of pedestrian level winds. For reference, Figure IV G-2 recaps the orientation of the study area and sub-parcels within the site.

- **Alternative 1 - No-build**: This alternative assumes continued use of the 9 story public parking garage and the surface parking lot on the development site bounded by Kingston, Bedford, Essex, and Lincoln Streets.
- **Alternative 2**: Includes a 400 ft high office tower at the Kingston-Bedford parcel and a 250 ft high retail/hotel building at the Lincoln-Essex parcel.
- **Alternative 3**: Includes a 325 ft high office tower at the Kingston-Bedford parcel and a 200 ft high retail/hotel building at the Lincoln-Essex parcel.
- **Alternative 4**: Includes a 250 ft high office building at the Kingston-Bedford parcel and a 150 ft high retail/hotel building at the Lincoln-Essex parcel.

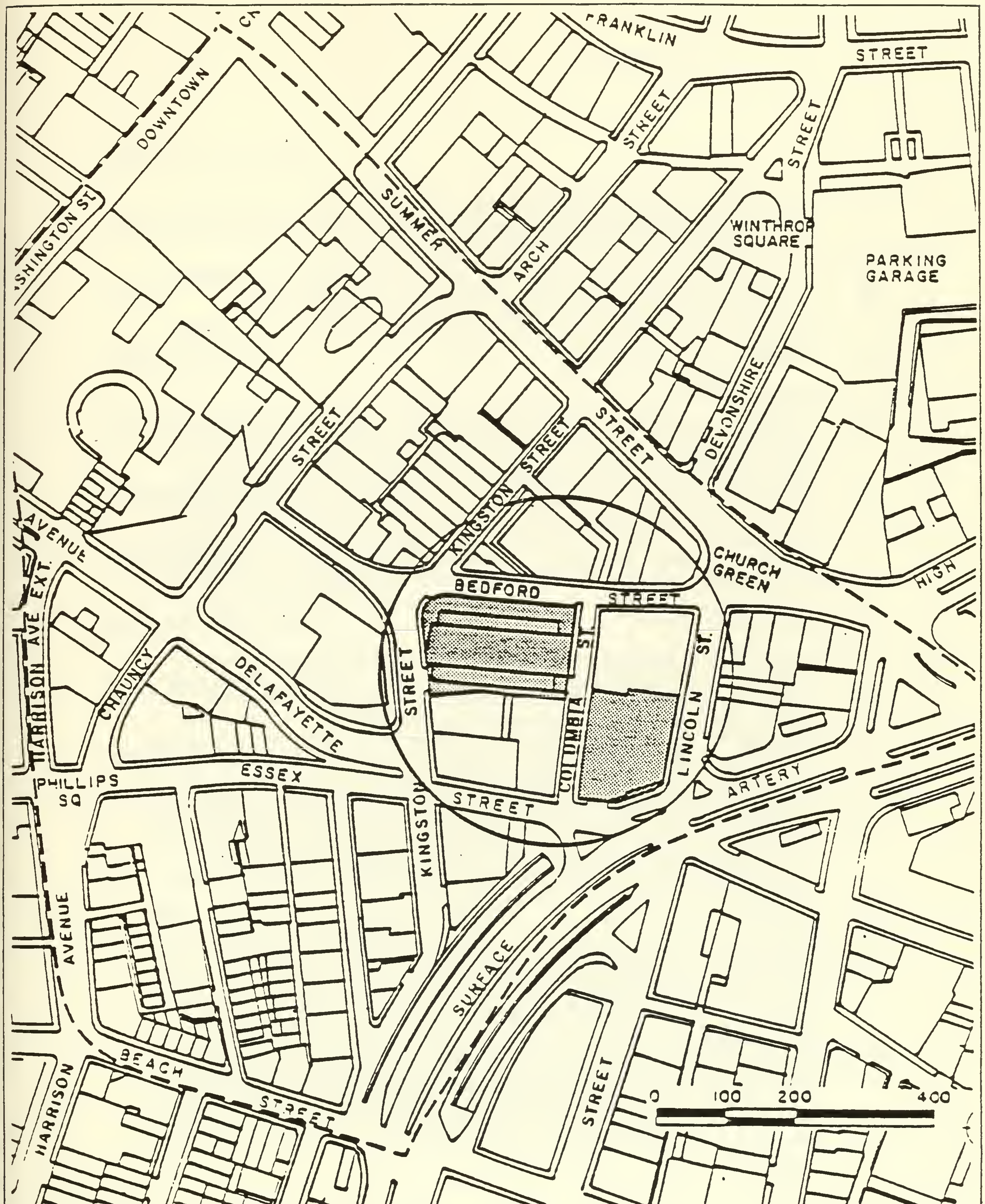


Figure IV G-2:
Orientation Plan of Study Area

- **Alternative 5**: Includes a 240 ft high office tower which extends the entire length of Kingston Street between Bedford and Lincoln Streets and a 200 ft high retail/hotel building at the Lincoln-Essex parcel.
- **Alternative 6**: Includes a 510 ft high office tower at the Lincoln-Essex parcel and a 9 story retail/office building on the remainder of the site.

A summary of the predicted pedestrian level wind conditions for all of the alternatives is presented in Table IV G-1.

Kingston Street

The best wind conditions on Kingston Street are expected for Alternative 1. Sidewalks along this street are sheltered from easterly and westerly winds by the existing buildings on either side of the street. For winds from the south, southwest, and northwest, a redirection of flow by the existing buildings is expected, but given the height of these buildings, it is unlikely that the magnitude of the wind speeds would cause pedestrian discomfort. Only in the vicinity of Bedford Street, where strong upper level winds from the north are predicted to be downwashed by 99 Summer Street (Flow Type A - Appendix E-1), are potentially uncomfortable wind conditions expected to be found. Otherwise, wind conditions for Alternative 1 are expected to be suitable for a sidewalk area and should be well below the BRA criteria.

Alternatives 2, 3, and 5 are all expected to have a significant impact on the wind climate along Kingston Street. For each of these development alternatives, a tall tower is located on the Kingston-Bedford parcel. This tower would intercept strong upper level winds from the prevailing southwest through northwest wind directions and deflect these winds down to pedestrian level (Flow Types A and C). Once at grade, these winds would be accelerated along the Kingston Street sidewalks. For each of these alternatives, the building step-backs are too small to have a significant impact on downwashed winds. The reduction in the height of the office tower from 400 ft. (Alternative 2) to 325 ft. (Alternative 3) is also too small to have a significant impact on the wind conditions at the pedestrian level. As a result of the above described wind action, wind speeds along Kingston Street could reach a level which would be uncomfortable for a sidewalk area and may be above the BRA 31 mph acceptability level.

For Alternative 4, the wind environment along Kingston Street is expected to be slightly better than that anticipated for Alternatives 2, 3, and 5, but not as good as Alternatives 1 and 6. The main reason for the expected improvement in the Kingston Street wind climate is the result of the reduction in the height of the office tower to 250 ft. The 150 ft. height reduction, when compared to Alternative 2, should be enough to show a perceivable reduction in wind speeds at the pedestrian level. Although the office tower for Alternative 5 is similar in height to the office tower of Alternative 4, the wind climate along Kingston Street is still expected to be marginally better for Alternative 4 because the west facade of the office tower is much narrower. The narrower facade on Alternative 4 would deflect less wind down toward Kingston Street than the wider face of Alternative 5 (Flow Type C).

AREA OF CONCERN	ALTERNATIVE 1	2	3	4	5	6
Kingston	○	●	●	◍	●	○
Essex	○	○	○	○	●	●
Essex-Surface Artery	○	●	○	○	●	●
South end of Lincoln	◍	●	◍	◍	●	●
North end of Lincoln	●	◍	◍	◍	◍	◍
Bedford Street	◍	●	●	◍	●	○
North end of Columbia	○	●	●	◍	○	○
South end of Columbia	○	●	◍	◍	●	N/A
Bedford Building Plaza	○	◍	◍	◍	○	N/A

● **POOR** Strong winds which are likely uncomfortable and could exceed BRA guidelines. Mitigation will be required.

◍ **FAIR** Accelerated winds noted for some directions and conditions may be uncomfortable for some activities. Some minor mitigation may be required.

○ **GOOD** Areas of wind shelter or slower wind speeds. Acceptable wind conditions are anticipated.

Table I-3
Summary of Pedestrian Level Wind Conditions: Qualitative Analysis

Alternative 6, the Developer's Proposal, is expected to create a wind climate similar to the no-build condition along most of Kingston Street. The building section of Alternative 6 on Kingston Street is similar in height to the existing parking garage. Therefore, it is unlikely that strong upper level winds would be deflected onto Kingston Street. The resulting pedestrian level wind environment should be acceptable for sidewalk uses and also should meet the BRA criteria.

Essex Street

For Alternative 1, the no-build case, the existing buildings to the north and south of this street are expected to block most winds approaching Essex Street. Only winds from the easterly and westerly directions, which align with the Essex Street, are expected to flow uninterrupted along the sidewalks of this street (Flow Type D). Even for these directions, the speed of the wind is not expected to be unusually high. The wind environment for the no-build condition should be well within the BRA guidelines and also should be acceptable for the intended activities.

With the exception of the Essex-Surface Artery intersection, Alternatives 2, 3, and 4 are all expected to have a minimal impact on the wind conditions along Essex Street. For each of these alternatives, the existing building at the northeast corner of the Kingston-Essex intersection is predicted to remain as part of the development. The towers of these alternatives are situated far enough away from Essex Street, that the interaction of strong upper level winds with the proposed towers and the subsequent downwash and acceleration of these winds should not extend to Essex Street. Therefore, the wind flow patterns are not expected to change significantly from Alternative 1. The resultant wind climate is expected to be similar to the no-build condition and should be acceptable for a sidewalk area.

At the Lincoln-Surface Artery intersection, it is anticipated that the pedestrian level wind climate would be deteriorated by the construction of any of the alternatives. For Alternative 2, winds from virtually all directions are expected to be deflected downward by the hotel/retail tower, and accelerated around the building corners (Flow Types A and C). While the wind speed increases anticipated in this area may be high enough to cause some pedestrian discomfort, particularly during the winter season, it is likely that wind speeds would remain below the BRA threshold.

For Alternatives 3 and 4, the floor plate of the hotel/retail tower is smaller than that for Alternative 2. The smaller facades of this tower would be more streamlined to the wind and therefore would deflect less wind down to pedestrian level. In addition, the podium on which the tower is situated should be large enough to intercept winds deflected downward by the tower, and keep them above pedestrian level. Therefore, for Alternatives 3 and 4, the wind speeds at Essex-Surface Artery intersection should be significantly better than Alternative 2 but slightly worse than the no-build case. The wind climate at the Essex-Surface Artery intersection should remain suitable for intended pedestrian uses and be below the BRA acceptance criteria.

For Alternative 5, the south side of the street could be exposed to slightly higher wind speeds when winds flowing around the hotel/retail tower accelerate off the podium and reach grade on the south side of Essex Street. Winds from the east and northeast could potentially be accelerated between the hotel/retail and office buildings and onto Essex Street (Flow Type D). As a result, the wind conditions could be perceived as particularly uncomfortable since pedestrians walking along the north sidewalk of Essex Street would enter a very strong crosswind flowing between the proposed buildings. This sudden change from the relatively low wind speeds on either side of the opening could be quite disconcerting to pedestrians.

The Kingston-Essex and Lincoln-Essex intersections would be considerably more windy for Alternative 5 than for the no-build condition. At Kingston Street, winds from the southwest quadrant, which are deflected down the west face of office building, would be accelerated around the building corner (Flow Type C). At Lincoln Street, a similar downwash of easterly winds would result in accelerated flows at that building corner. In both areas, potentially uncomfortable conditions are expected.

For Alternative 6, wind speeds along the Essex Street sidewalks would likely be higher than the no build condition. The wide south facade of the 510 ft. office tower would intercept winds from the southeast through southwest wind directions, deflect these winds downward and either accelerate them around the building corners (Flow Type C) or backwash them across the street (Flow Type A). The podium and building step-backs proposed for the south side of the proposed tower are not wide enough to block downwashed winds and prevent them from reaching pedestrian level. A similar wind action is expected for west and northwest winds off the west face of the proposed tower. However, for westerly winds, the potential for wind speed increases may be mitigated to a certain extent by the presence of building step-backs, a narrower tower facade, and a podium. The size of the building step-backs and podium along the west side of the tower are large enough to reduce the impact of downwashed winds.

As a result of the above described wind activity, wind speeds are likely to reach an uncomfortable level at both the Essex-Surface Artery and Essex-Kingston building corners and may reach a level close to or slightly above the BRA criteria. In the middle of Essex Street, where wind speeds are likely to be slower, wind conditions may still be uncomfortable for intended activities, but should stay within the BRA guidelines.

In the proposed plaza at the Essex-Kingston intersection (Alternative 6), a varying wind climate is expected. Winds from the southerly directions would impact on the south facade of the office tower and accelerate towards this street corner. Similarly, winds from the northwest quadrant which are funneled along Kingston Street could also influence wind conditions within the plaza area. The resultant wind comfort levels around the perimeter of the plaza could be uncomfortable for most pedestrian activities. Closer to the building entrance in the recessed plaza, better pedestrian level wind conditions are expected. The recessed nature of the plaza should provide some protection to the entrance doors for accelerated winds from the southerly and northwesterly directions.

To improve the wind conditions within the plaza, low-level landscaping or wind screens should be added to the plaza area. These solutions could be incorporated into a trellis structure which is presently proposed around the perimeter of the plaza. To reduce the impact of downwashed winds on the sidewalks, solutions in the form of solid or deciduous canopies should be considered along both Kingston and Essex Streets. These measures would dissipate winds downwashed to the sidewalk by the office tower and improve wind comfort levels.

At the Lincoln-Essex building corner of Alternative 6, the development of remedial measures to control downwashed winds also should be considered, particularly for the entrance doors proposed at this building corner. Solutions to the uncomfortable winds anticipated in this area could include recessing the entrance doors to provide a localize area of wind shelter, moving the entrance away from the building corner and placing it in an area less susceptible to accelerated winds, planting a canopy of deciduous trees along Essex Street, or increasing the size of the building step-backs on the south side of the building.

Lincoln Street

Close to the Bedford-Lincoln intersection, the wind climate for Alternative 1 is dominated by the interaction of strong upper level winds with the facades of 100 and 125 Summer Street. Winds from the prevailing southwest and northwest quadrants are accelerated along this street. As indicated in the FEIA for 125 Summer Street, the wind conditions on the east side of Lincoln Street at Bedford Street are very uncomfortable and presently exceed the 31 mph BRA criteria. Farther to the south, where the impact of winds off 100 Summer Street is less evident, the wind climate is better and is considered acceptable for intended uses.

The addition of either Alternative 2 or Alternative 5 to the development site is expected to improve wind conditions on Lincoln Street in the vicinity of Bedford Street. Winds from the southwest and west, which presently impact on the west face of 125 Summer Street and are downwashed into the street, would be blocked by the proposed office and hotel/retail towers. For the remaining wind directions, wind flow characteristics in this area would be similar to those which presently exist. The wind speed reductions for the west and southwest wind may result in wind conditions which satisfy the BRA criteria at the Lincoln-Bedford intersection.

For Alternatives 3 and 4, the blockage of southwest and west winds by the proposed towers is also expected. However, the tower floor plate for the hotel/retail section of the development is smaller than the floor plate of Alternatives 2 and 5 and therefore would not block as much wind. The pedestrian level wind environment along the north end of Lincoln Street should be slightly better than the existing wind climate, but it is unlikely that the wind climate would be as good as that expected for Alternatives 2 and 5.

Alternative 6 is more streamlined to westerly winds than the other alternatives and is not expected to block westerly winds. However, the building would effectively block winds from the southwesterly directions. Therefore, wind conditions at the Lincoln-Bedford interaction should be slightly better than existing site conditions, but not as good as the other alternatives.

On the south end of Lincoln Street, the existing wind conditions are again dominated by the interaction of wind with 125 Summer Street. Winds from the south and prevailing northwest quadrant are predicted to be deflected down the facades of 125 Summer Street and accelerated around the building corner (Flow Types A and C). Quantitative wind speed measurements undertaken in the study of 125 Summer Street show that the wind conditions in this area of Lincoln Street would be marginally acceptable for a sidewalk area and would meet the BRA criteria.

The addition of any of the alternatives to the development site is expected to deteriorate the wind climate at the south end of Lincoln Street. Winds from the north, east, south, and southwest are all expected to be deflected downward by the proposed tower at the southeast corner of the development site. Once at grade, these winds would be accelerated between the proposed tower and 125 Summer Street (Flow Type D). The highest wind speeds are anticipated to occur at the south end of Lincoln Street if Alternatives 2, 5, or 6 are located on the development site. For these alternatives, the tower located at the southeast corner of the development site extends directly to grade. This would promote the acceleration of wind at the pedestrian level on Lincoln Street. Wind speeds uncomfortable for sidewalk areas are likely to be found. The wind speed increases anticipated for these alternatives may also cause wind speeds to exceed the BRA 31 mph criteria.

The development of remedial solutions to reduce the impact that these alternatives are expected to have on the existing wind climate in this area would be difficult to achieve due to the limited space available for solutions. The addition of a solid canopy or planting a canopy of deciduous trees along the Lincoln Street side of the development may improve wind comfort levels on-site but would do little to improve wind conditions on the east side of Lincoln Street. To improve wind conditions on the east side of Lincoln Street, it is likely that significant changes to the development's mass would have to be undertaken.

For Alternatives 3 and 4, the hotel/retail tower at the southeast corner of the development site has a smaller floor plate and is located on a podium. As previously discussed, this building is more streamlined to wind, and therefore less wind is deflected downward. Any wind that is deflected downward would be slowed by the podium. The wind speed increases predicted to occur at the south end of Lincoln Street for these building alternatives are unlikely to be as severe as those expected for Alternatives 2 and 6. Pedestrian level wind conditions may reach levels which are marginally unacceptable for a sidewalk but should satisfy the BRA criteria.

Bedford Street

For Alternative 1, the no-build condition, winds from most directions are predicted to flow over the low-rise surrounding buildings and strike the tall building at 99 Summer Street (Flow Types A and C). This wind would be deflected down the facades of 99 Summer Street and accelerated at the pedestrian level. The area expected to receive the brunt of this wind activity is the area to the north of Columbia Street. However, quantitative information obtained from the FEIA for 125 Summer Street shows that the wind speeds in this area would be within the BRA criteria and would be acceptable for a sidewalk area.

Alternatives 2 and 3 are predicted to create the windiest conditions along Bedford Street. The tall office tower located at the Kingston-Bedford intersection for both of these alternatives would cause winds from the prevailing southwest through northwest directions to deflect downward and accelerate between the proposed office tower and 99 Summer Street (Flow Type D). The resultant wind climate would be worse than that which presently exists at the site and could potentially exceed the BRA criteria.

Alternatives 4 and 5 are expected to cause pedestrian level wind flows similar to those described for Alternatives 2 and 3. However, since the office tower is significantly lower for Alternatives 4 and 5, less wind would deflect down to grade and accelerate along Bedford Street. Wind speeds are still anticipated to be above those for the Alternative 1 and 6 conditions, but would likely be better than those created by Alternatives 2 and 3.

The construction of Alternative 6 on the development site is expected to slightly improve the wind conditions along Bedford Street. The proposed tower would block winds from the southerly directions which presently impact upon the upper levels of the building at 99 Summer Street and are deflected down to Bedford Street. For the remaining wind angles, wind speeds and wind flow patterns similar to those which presently exist are expected. Wind speeds below the BRA criteria and acceptable for intended activities are expected with Alternative 6.

Columbia Street

Columbia Street is presently well sheltered from most prevailing winds.

The existing buildings to the east and west of this street are low-rise in nature and therefore do not induce the downwash of strong upper level winds. The strongest winds tend to occur for the northerly and southerly directions when the winds are aligned with the street. However, it is unlikely that the speed of the winds from those directions would be of a magnitude to cause wind comfort problems for pedestrians.

At the south end of Columbia Street, Alternatives 3 and 4 are predicted to have the least impact on the existing wind climate. For these alternatives the smaller floor plate for the hotel/retail tower and the podium would reduce the amount of wind deflected down to grade. Only southerly winds are predicted to be higher than the no-build case on this section of Columbia Street. Therefore, wind comfort levels are not expected to be significantly different than those which presently exist.

The highest wind speeds and least comfortable wind conditions on the south end of Columbia Street would be created by Alternatives 2 and 5. For both of these alternatives, the proposed hotel/retail tower is predicted to cause upper level winds from most directions to be deflected downward and accelerated at the pedestrian level. The podiums and building steps of these alternatives are too small to be efficient wind control measures. Wind conditions which are uncomfortable for most activities are likely, but wind speeds should meet the BRA criteria.

Alternative 6 completely covers the south end of Columbia Street. Comments on the resultant pedestrian level wind climate are obviously not applicable. However, at the north end of the street, in the entrance area for this alternative, the wind speeds are predicted to be lower than for Alternative 1. The proposed development surrounds this area on three sides and therefore would offer considerable protection from most wind directions. Wind conditions in this area are likely to be well suited for an entrance area and should be well below the BRA criteria.

For Alternative 5, the wind conditions expected on the north end of Columbia Street would be similar to wind conditions at the existing site. The proposed office building would block winds from most prevailing directions in the southwest and northwest quadrants. Only the southerly winds are expected to be accelerated along the north end of Columbia Street if Alternative 5 is built on the site.

The addition of the office tower on the southeast corner of the Kingston-Bedford intersection for Alternatives 2, 3, and 4 is likely to result in accelerated wind flows on the north end of Columbia Street. This wind activity could result in wind speeds which are high enough to cause some pedestrian discomfort. The worst wind conditions would be expected for the tallest towers (Alternatives 2 and 3). Somewhat slower winds may occur with the shorter tower of Alternative 4.

Bedford Building Plaza

This area does not exist for Alternative 6 and therefore no comments have been made in this section for this alternative.

For the existing site conditions (Alternative 1), this area is used as a surface parking lot. Winds from most directions flow unobstructed across this area of the development site. The FEIA of 125 Summer Street shows that this exposure does not have a significant impact on the pedestrian wind comfort levels and wind conditions suitable for walking activities are expected across this area of the site.

The addition of any of the build alternatives is likely to deteriorate the existing wind climate in the area between the Bedford Building and the proposed hotel/retail building. The largest increase in wind speeds is likely to be experienced if Alternative 2 is added to the site. The tall retail/hotel building is expected to downwash strong upper level winds from the north, northeast, east, southwest, and west directions into this area. The magnitude of the wind speed increases may be enough to cause winds which are uncomfortable for walking. However, they should remain below the 31 mph threshold speed.

For Alternatives 3 and 4, the wind speed increases are not expected to be as large. Again the smaller floor plate of the retail/hotel tower and the presence of the broad base on which the tower is situated would tend to reduce the amount of wind downwashed to pedestrian level. Although wind speeds are still likely to be above the existing wind comfort levels, wind conditions should remain suitable for walking activities.

For Alternative 5, wind conditions are expected to be slightly better than for Alternatives 2 and 3, but not as good as for Alternative 1. The elongated Kingston Street facade of the office building would block winds from the southwest and west directions and would create rather calm conditions to the south of the Bedford Street building. For the other alternatives, these winds would be funneled between the existing Bedford Street building and the retail/hotel building. However, the funneling of easterly winds is still expected to be present with Alternative 5 and therefore wind speeds may be slightly higher than those levels which presently exist.

Conclusions and Recommendations

Conclusions

- The best wind conditions are expected for the no-build alternative.
- Alternative 2 would result in significant wind speed increases on Kingston, Bedford, Lincoln, and Columbia Streets.
- The setbacks for the office tower of Alternatives 2, 3, and 4 are too small to block winds downwashed by the tower.
- There is the potential for wind speeds to exceed BRA guidelines at the building corners of Alternative 2.
- Alternative 3 would have less of an impact on wind conditions on Essex, Columbia, and Lincoln Streets than Alternative 2 due to the smaller tower floor plate of the hotel/retail building.
- The smaller tower floor plate and the podium on the hotel/retail tower for Alternatives 3 and 4 are both positive wind control features.
- A 75 ft. reduction in the height of the office tower (Alternative 2 at 400 ft.; Alternative 3 at 325 ft.) is not expected to have a significant impact on the pedestrian level winds.
- Wind flow patterns around Alternatives 3 and 4 are expected to be similar.
- A 150 ft. reduction in the height of the office tower (Alternative 2 at 400 ft.; Alternative 4 at 250 ft.) may be sufficient to reduce the effects of downwashed winds on Kingston, Bedford, and Columbia Streets.
- Alternative 5 could cause uncomfortable wind conditions on Kingston, Bedford, Lincoln, Essex, and Columbia Streets.
- Any improvements in the pedestrian level wind environment gained by reducing the tower heights for Alternative 5 would be offset by the wider building facades.
- Alternative 6, at over 500 ft., would cause wind speed increases on Essex and Lincoln Streets.
- Alternative 6 should slightly improve wind conditions on Bedford and Columbia Streets and the northern section of Lincoln Street.
- Wind conditions in the Alternative 6 plaza would vary from suitable for intended activities at the entrance doors to uncomfortable for most activities closer to the sidewalk.

° Alternative 5 should have the least impact on the wind climate in the pedestrian area to the south of the Bedford Street building. Alternative 2 could create uncomfortable wind conditions in that area while Alternatives 3 and 4 would cause wind speed increases, but wind conditions should remain suitable for walking.

In summary, Alternatives 4 and 6 present the best options for the site next to the no-build case.

Recommendations

Quantitative wind speed measurements in a boundary layer wind tunnel should be undertaken as part of the FEIR to accurately define the no- build wind conditions and to quantify the impact of the selected design alternative.

In areas of wind impact, mitigative measures in the form of landscaping and architectural details should be investigated as part of the FEIR.

The wind control capabilities of mitigating measures should also be defined by quantitative wind speed measurements in a wind tunnel.

Areas where development would cause accelerated winds are:

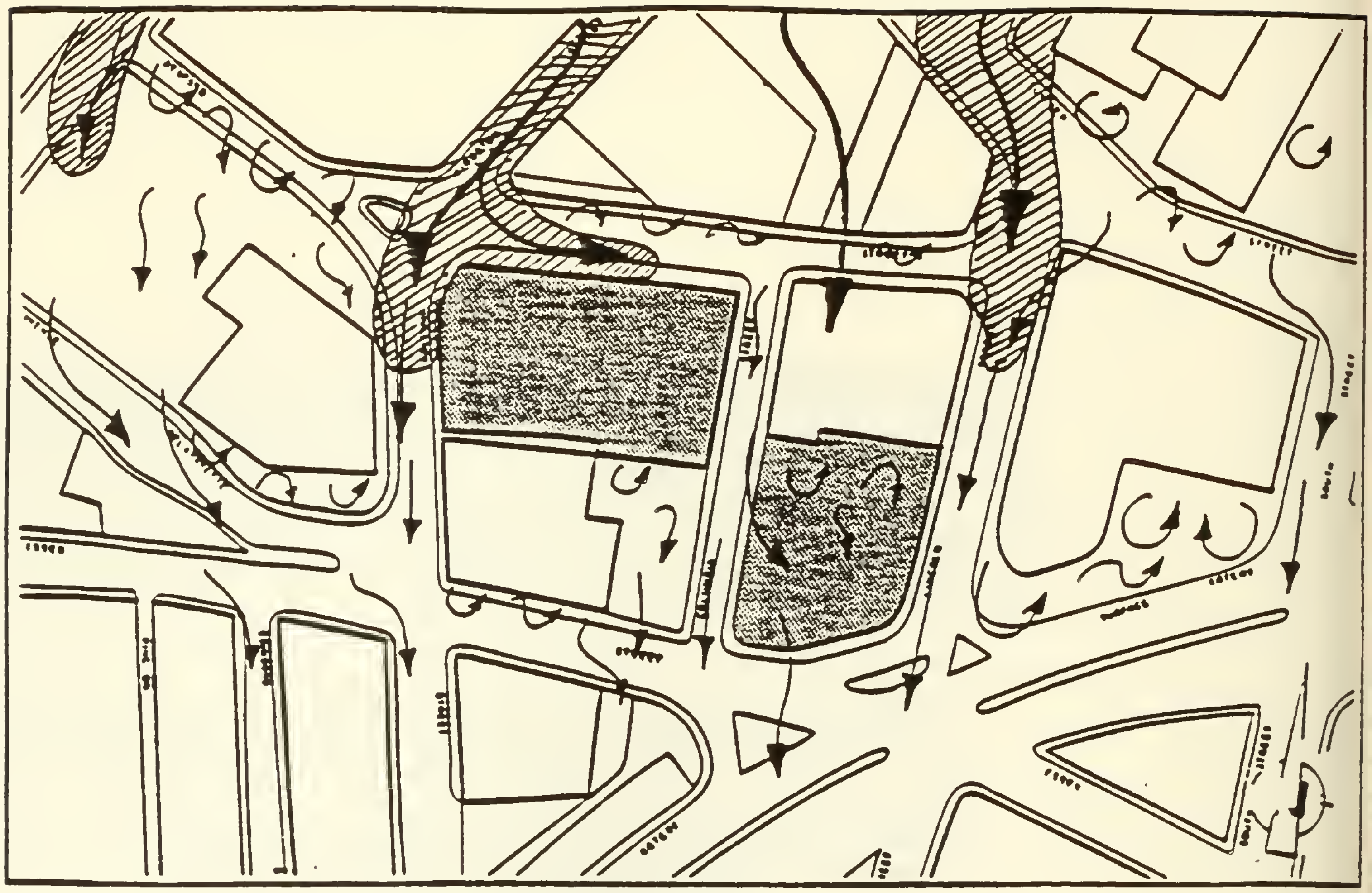
(1) Kingston-Bedford intersection

(2) Essex-Kingston intersection

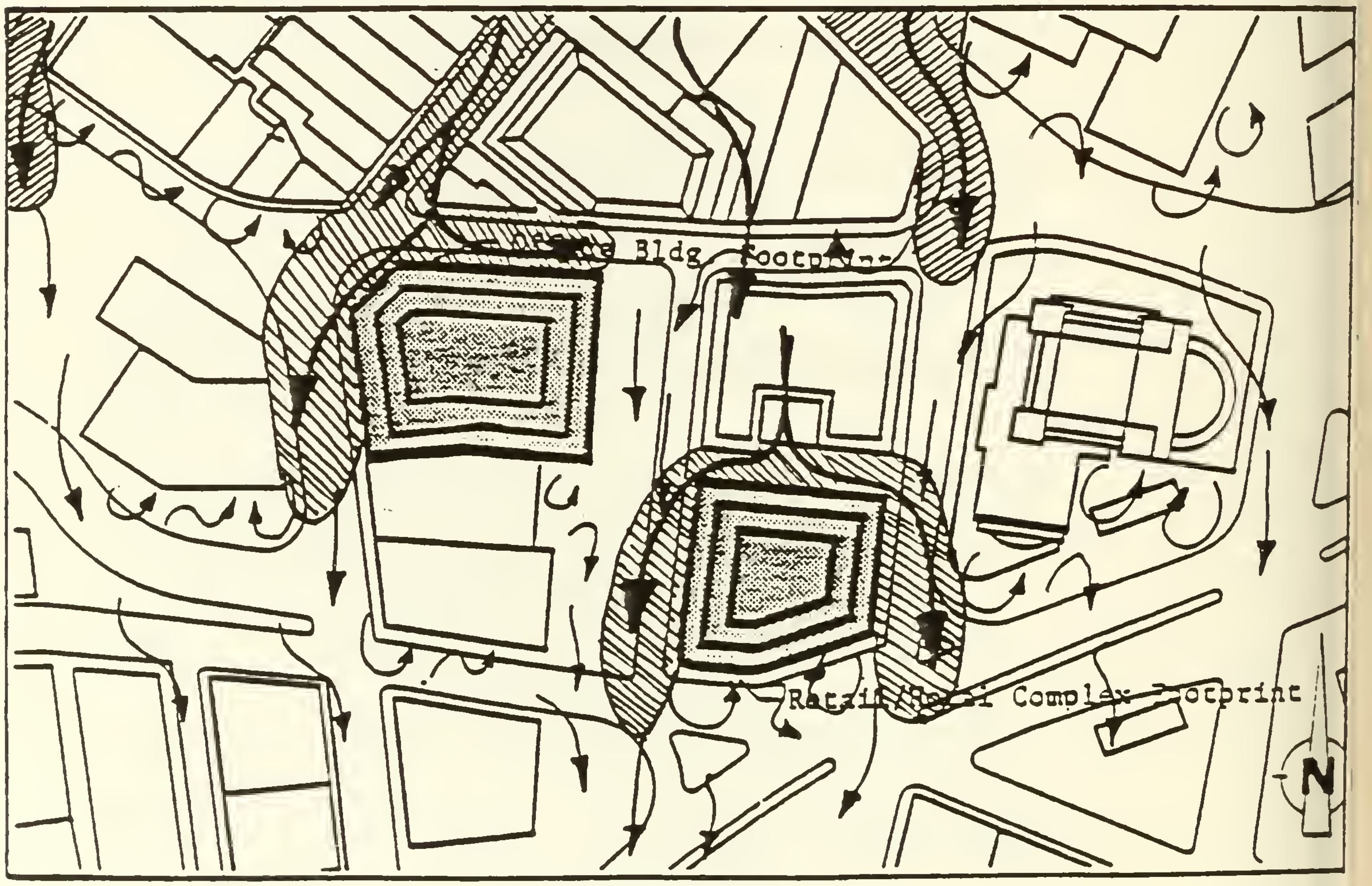
(3) Essex Street

(4) Lincoln-Surface Artery intersection

Quantitative measurements should be undertaken in these areas.



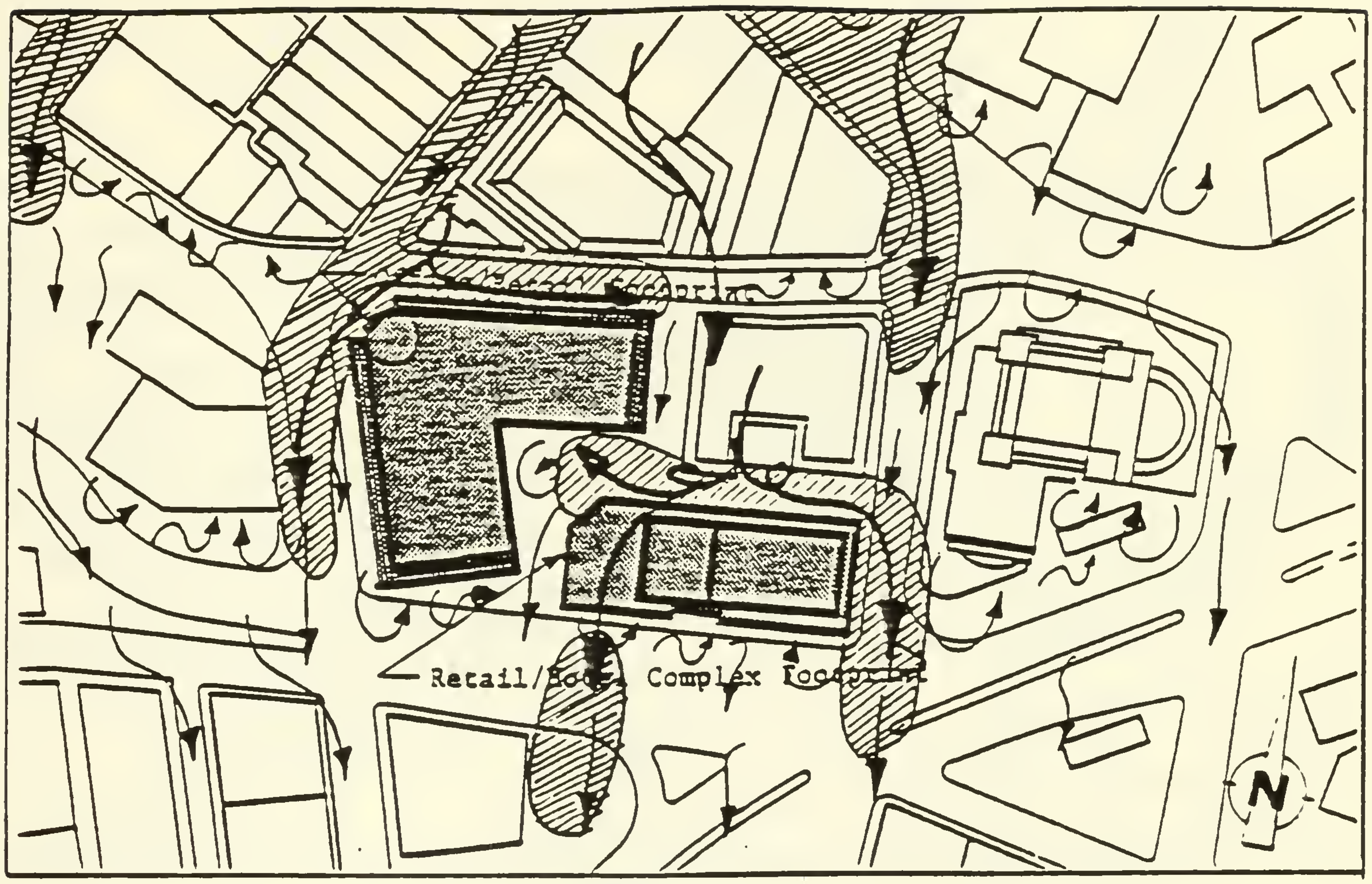
ALTERNATIVE 1



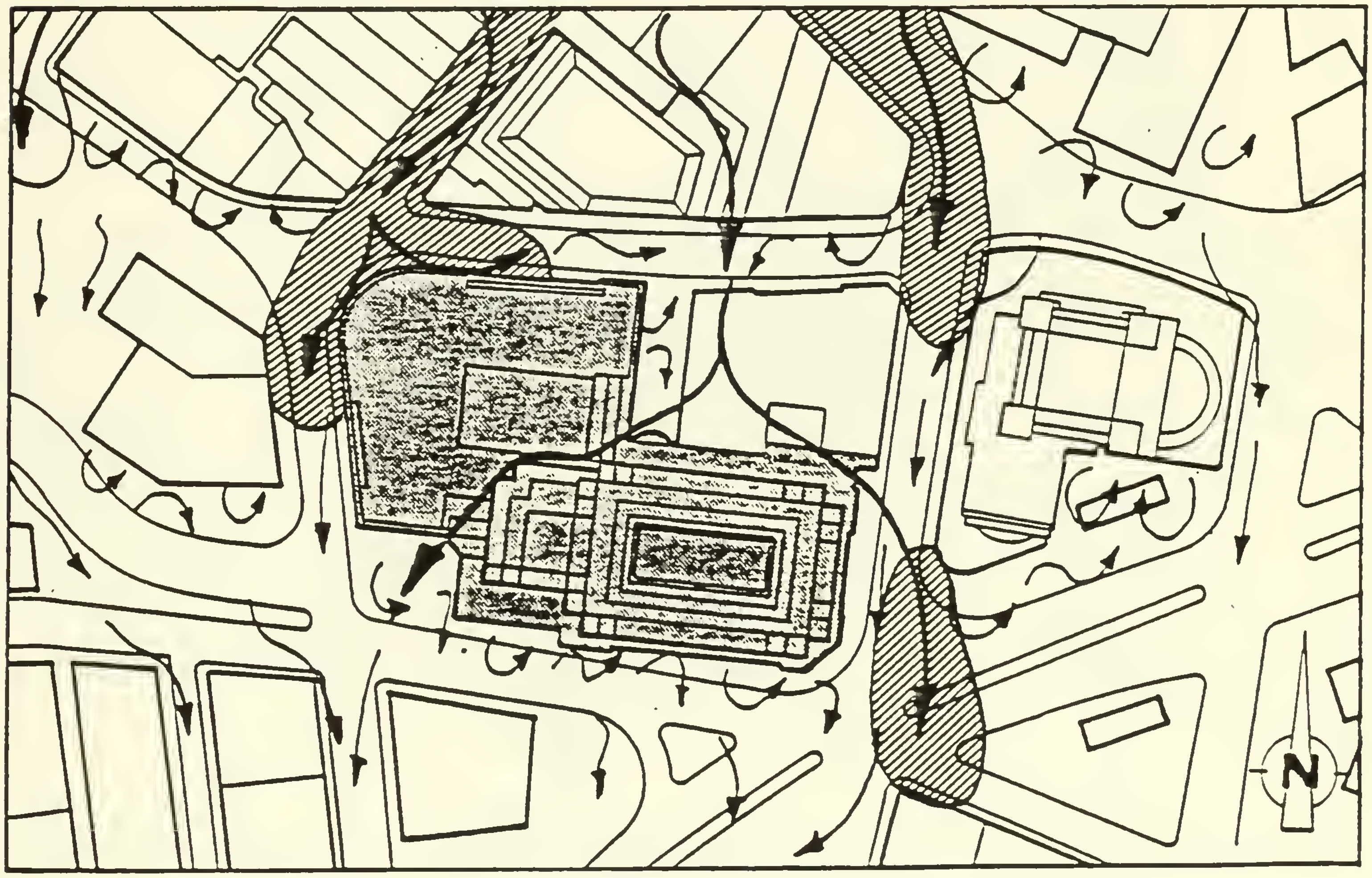
ALTERNATIVE 2

ACCELERATED FLOW REGIN

Figure IV G-3:
Anticipated Wind Flow Patterns - Wind from the North



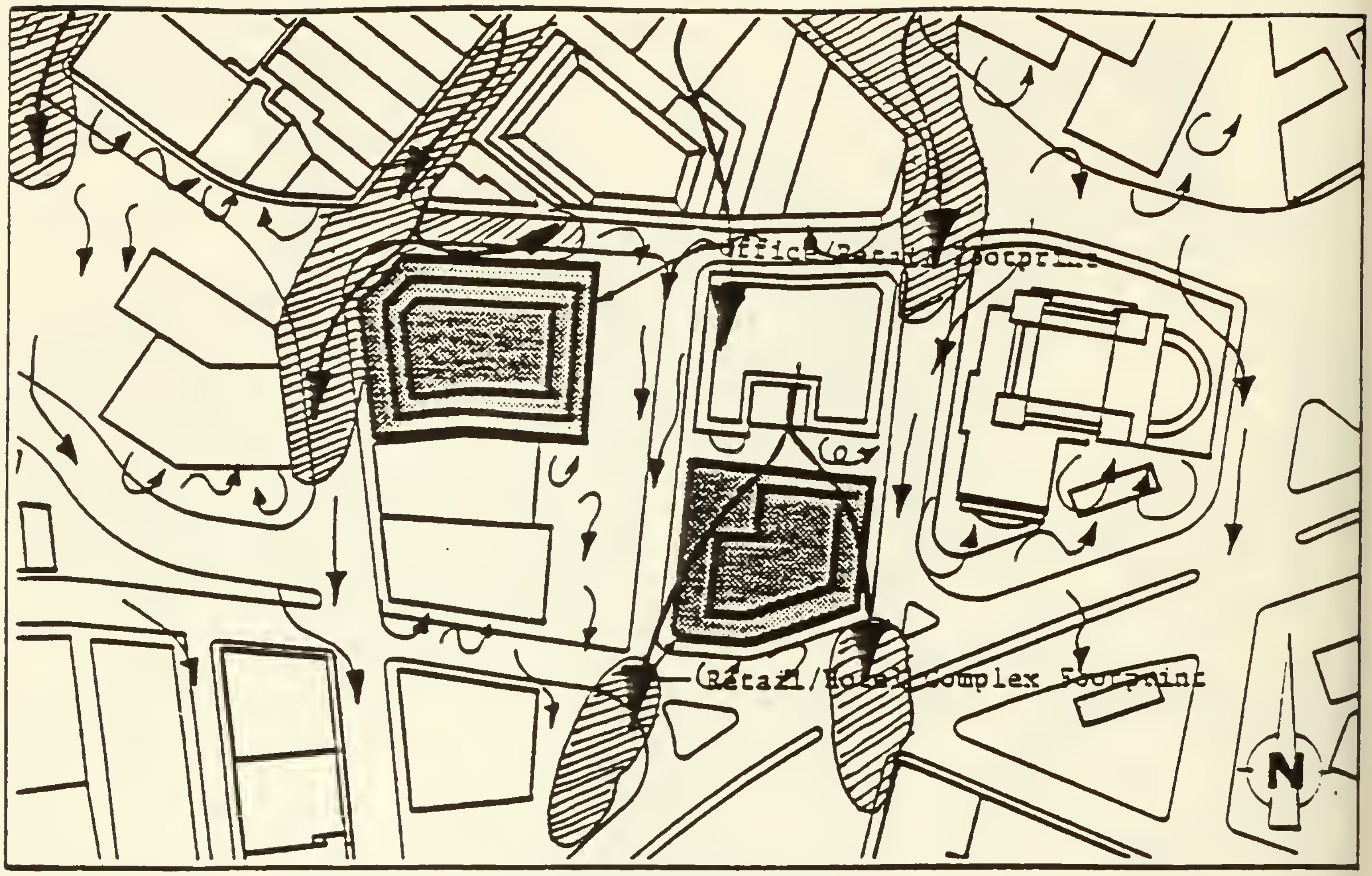
ALTERNATIVE 5



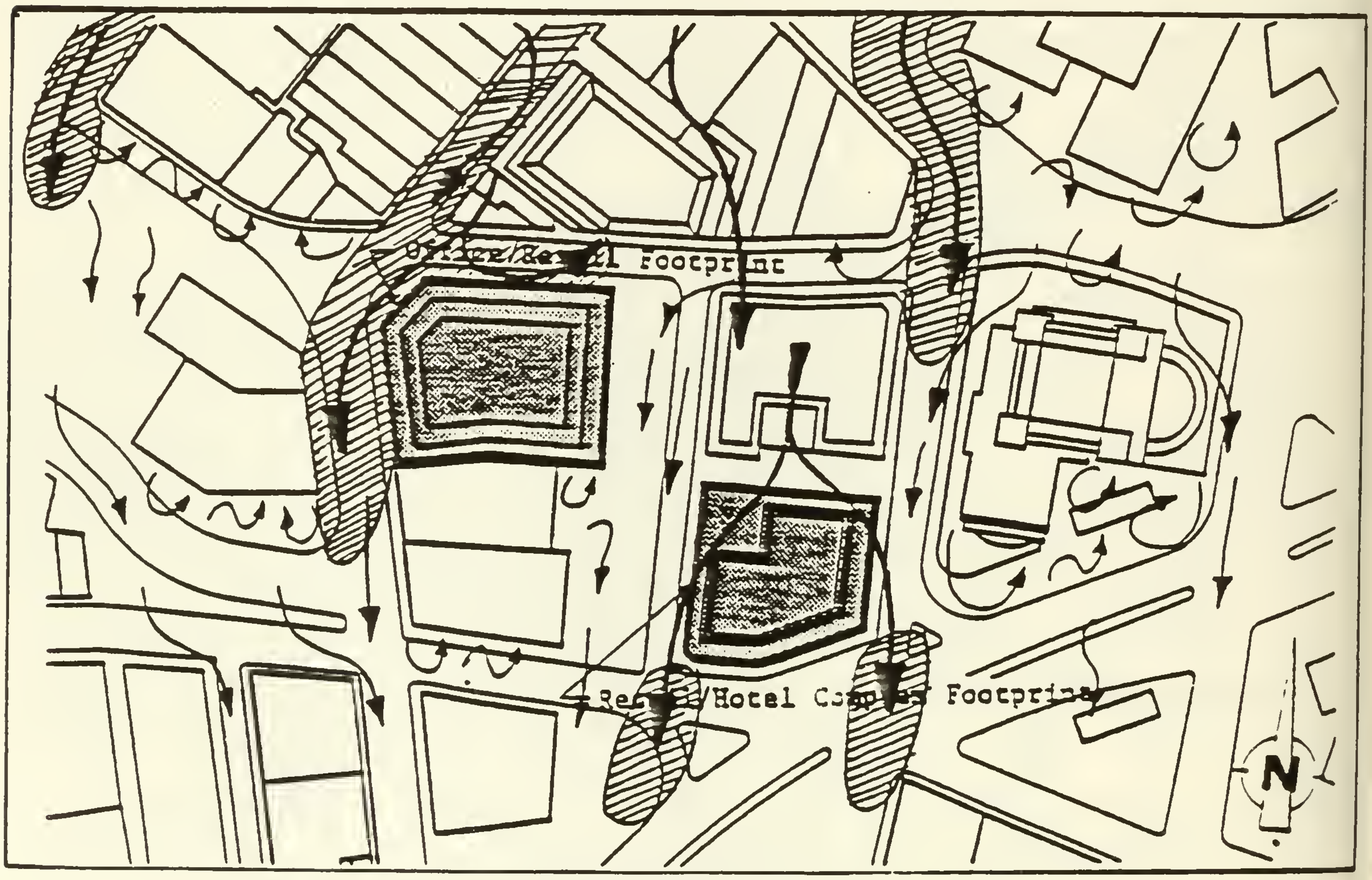
ALTERNATIVE 6

ACCELERATED FLOW REGION

Figure IV G-5:
Anticipated Wind Flow Patterns - Wind from the North



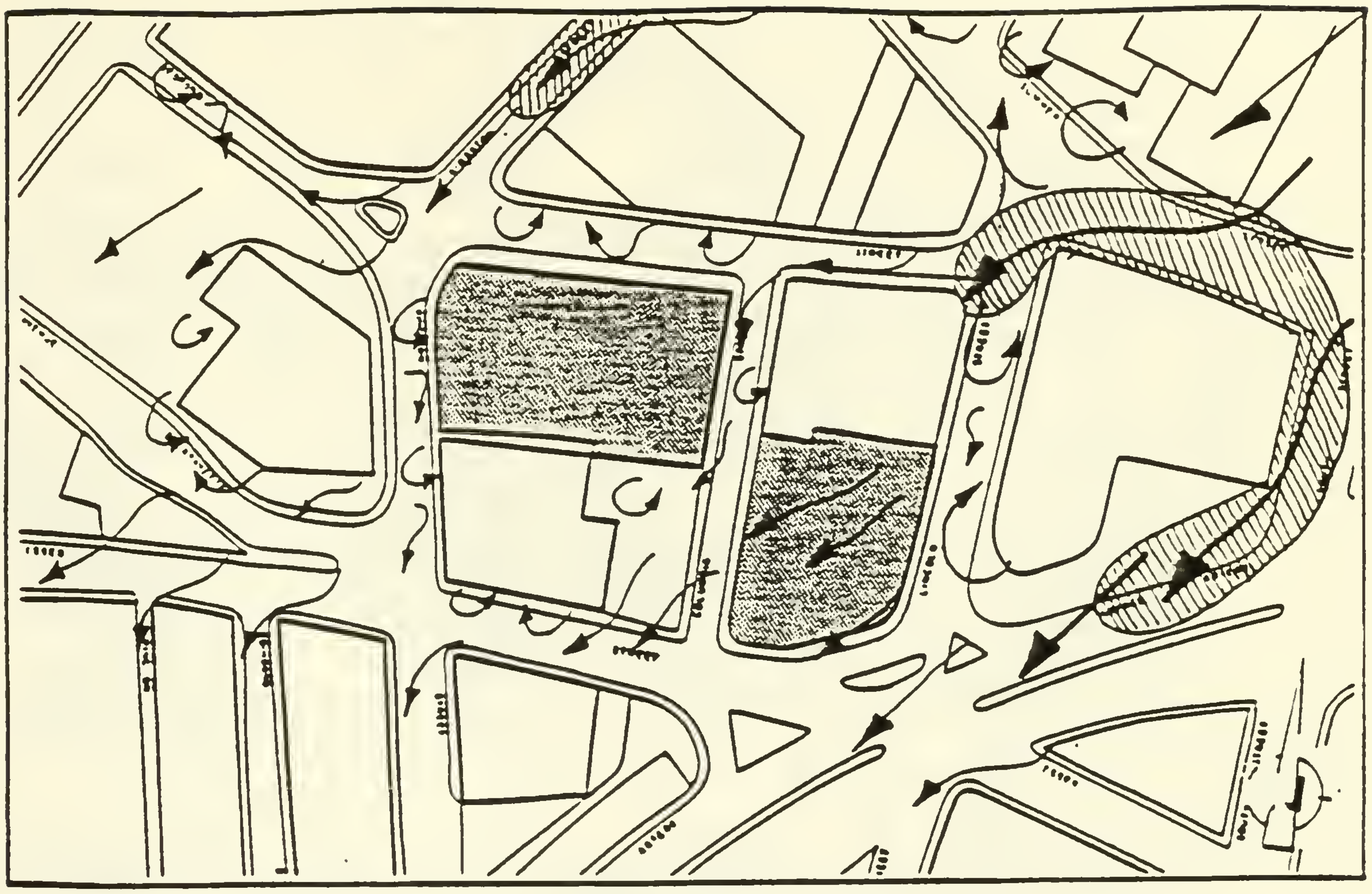
ALTERNATIVE 3



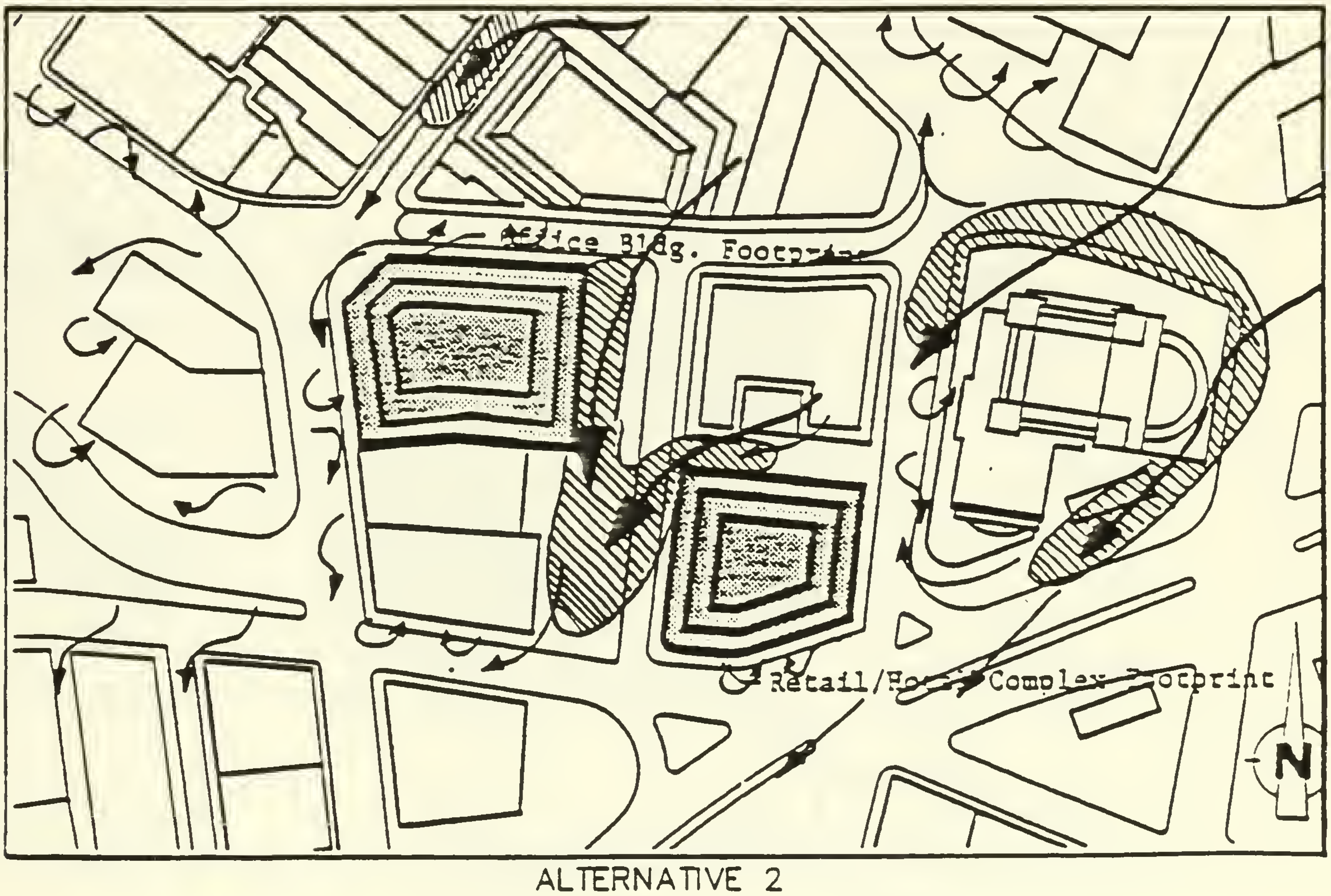
ALTERNATIVE 4

ACCELERATED FLOW REGION

Figure IV G-4:
Anticipated Wind Flow Patterns - Wind from the North



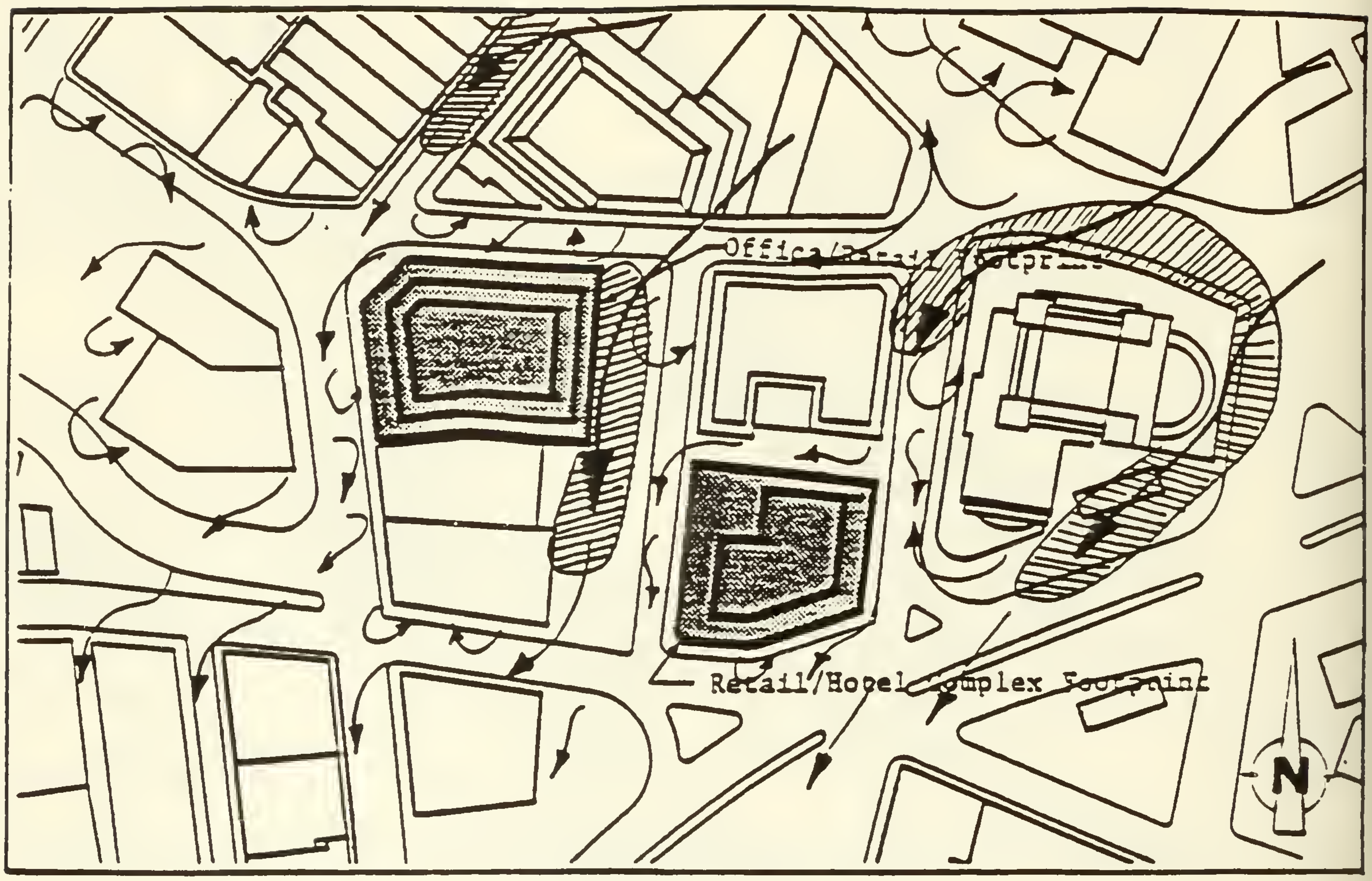
ALTERNATIVE 1



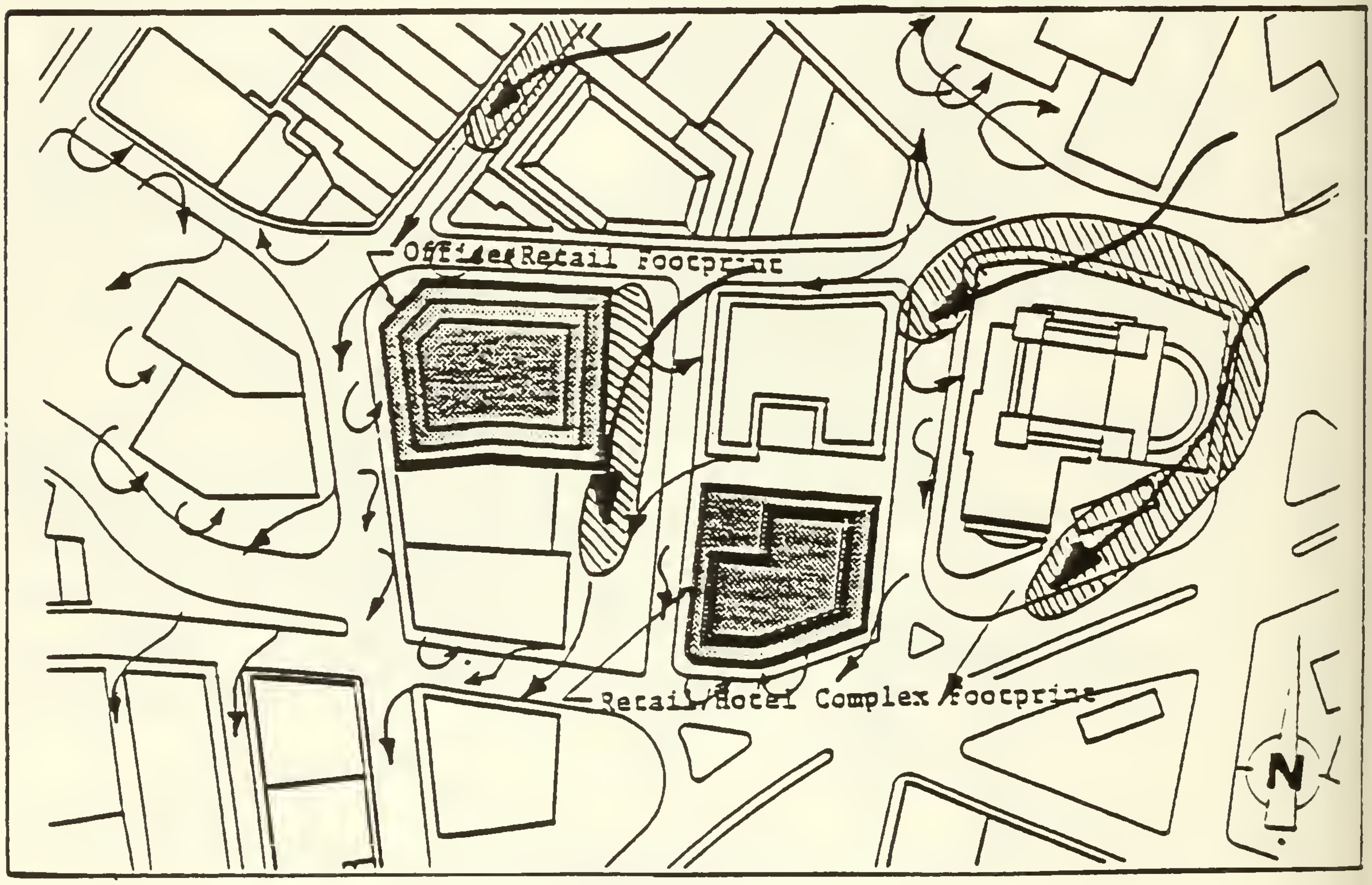
ALTERNATIVE 2

ACCELERATED FLOW REGION

Figure IV G-6:
Anticipated Wind Flow Patterns - Wind from the Northeast



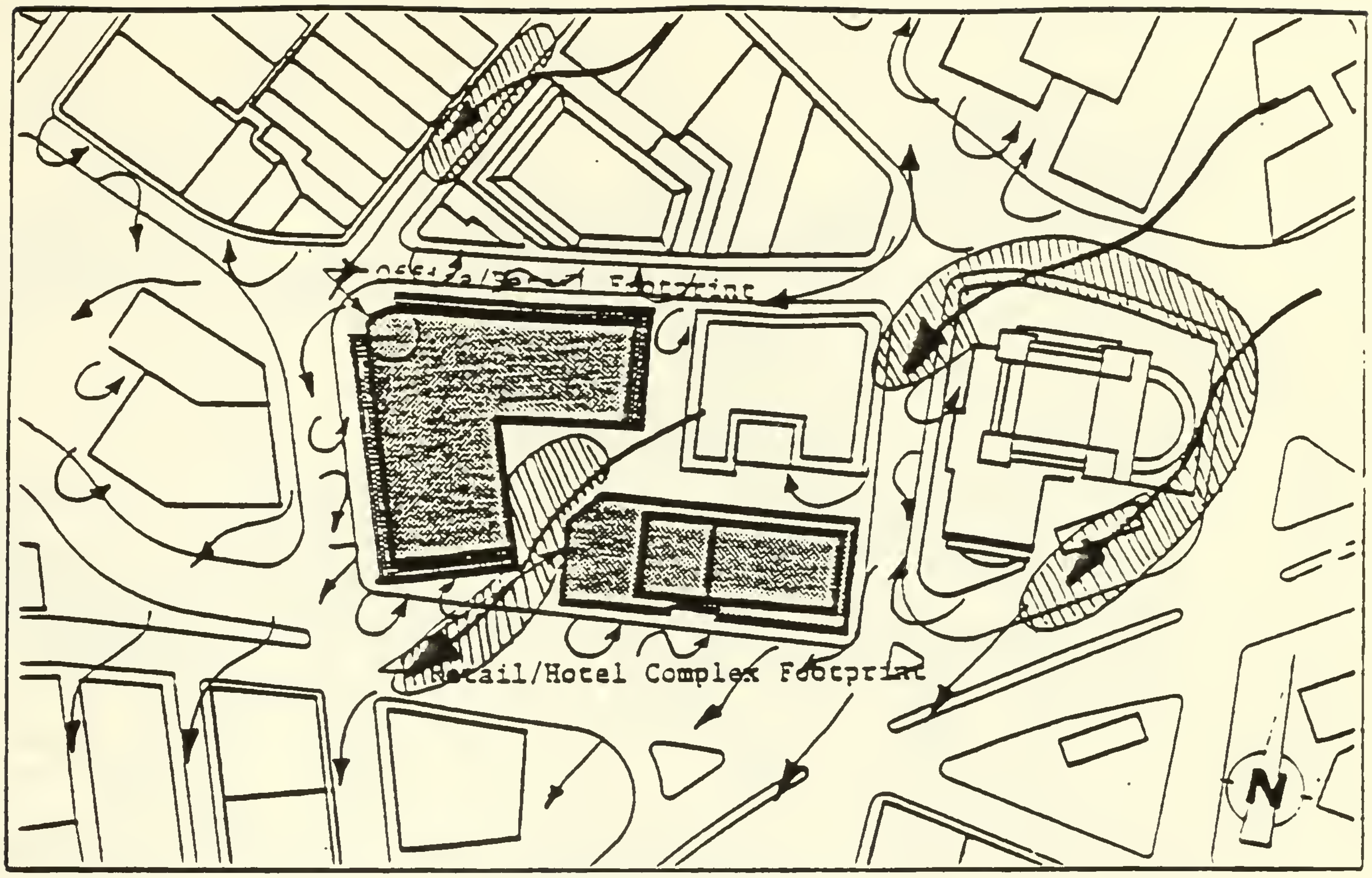
ALTERNATIVE 3



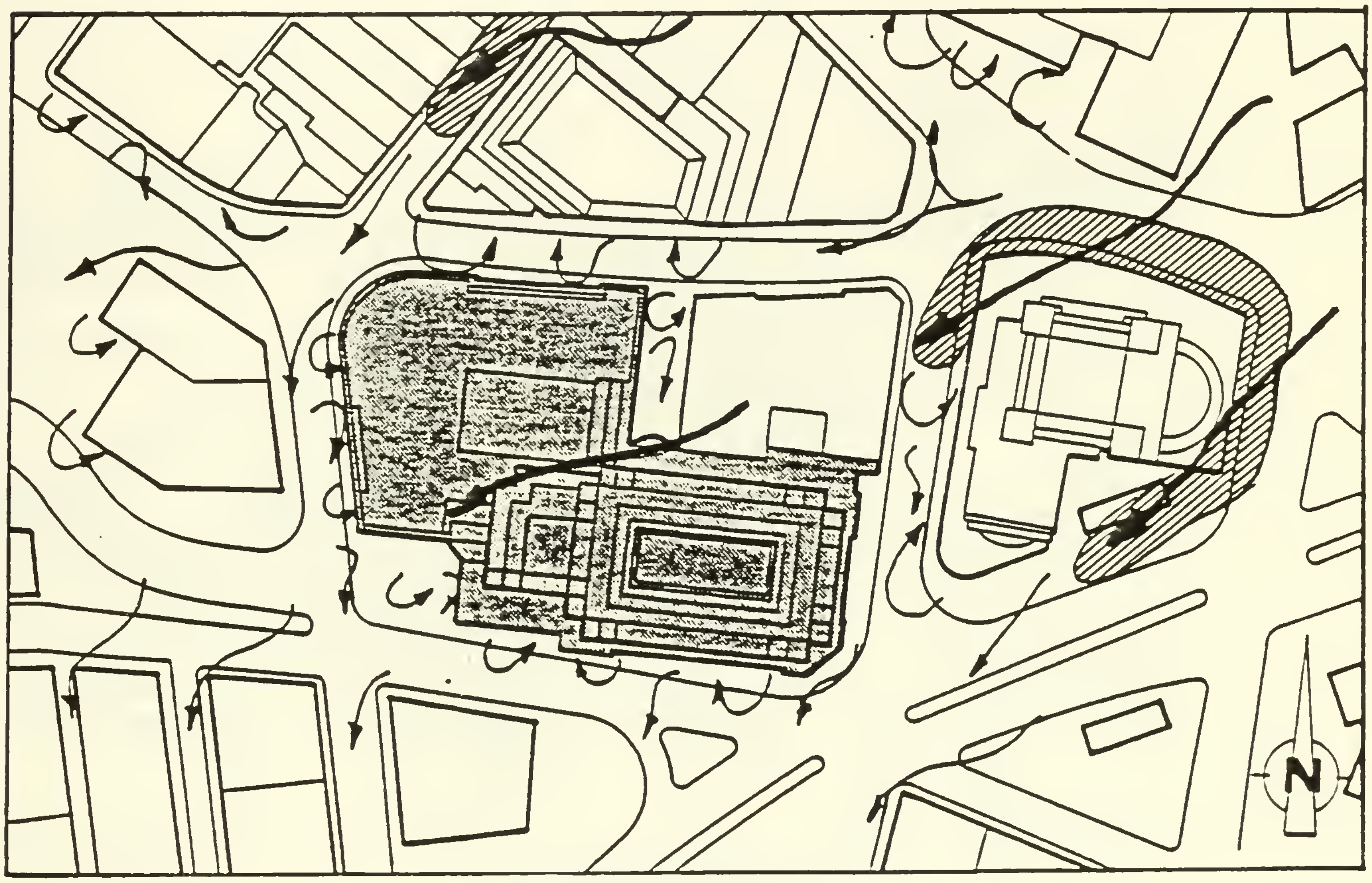
ALTERNATIVE 4

ACCELERATED FLOW REGN

Figure IV G-7:
Anticipated Wind Flow Patterns - Wind from the Northeast



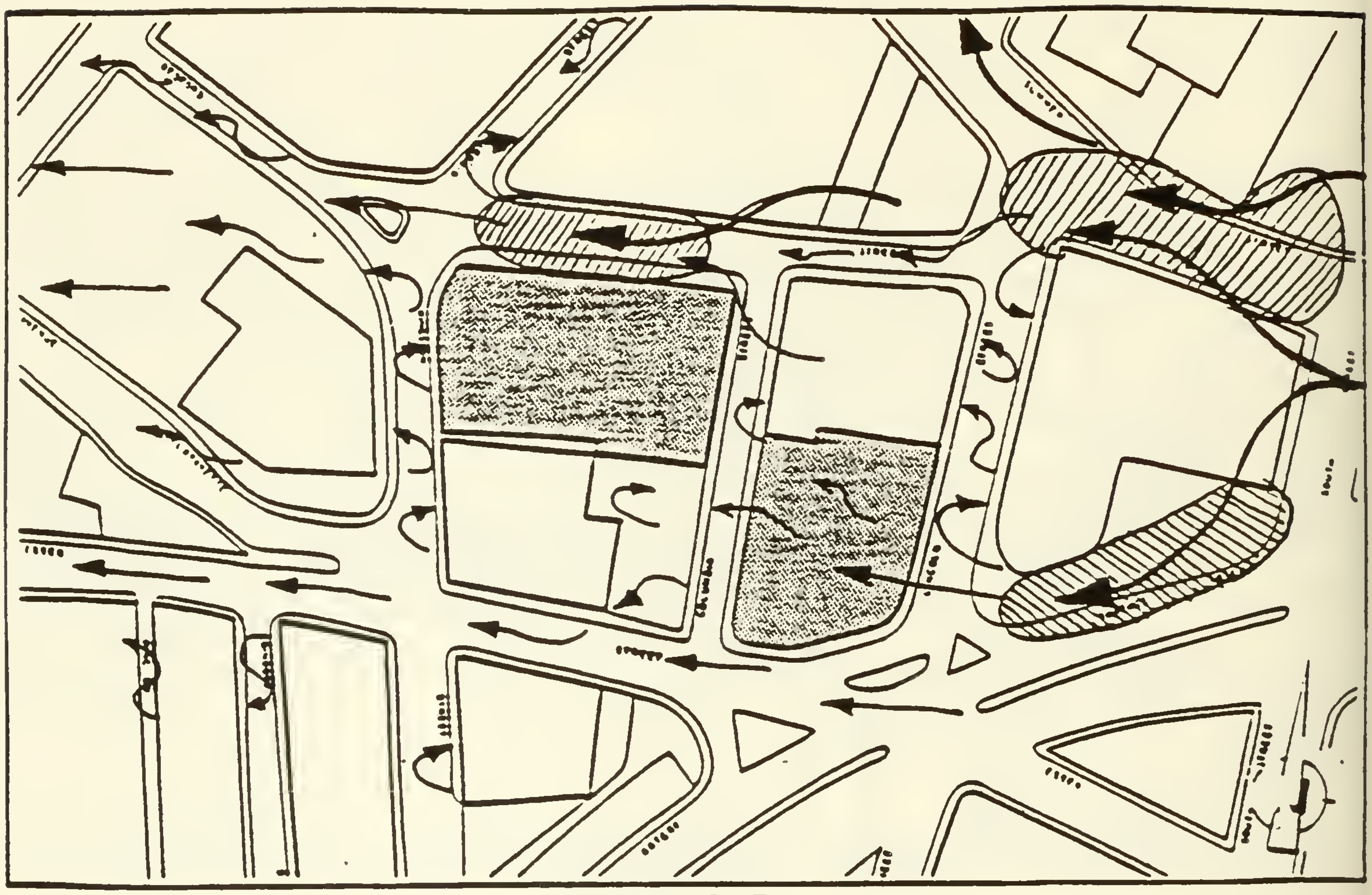
ALTERNATIVE 5



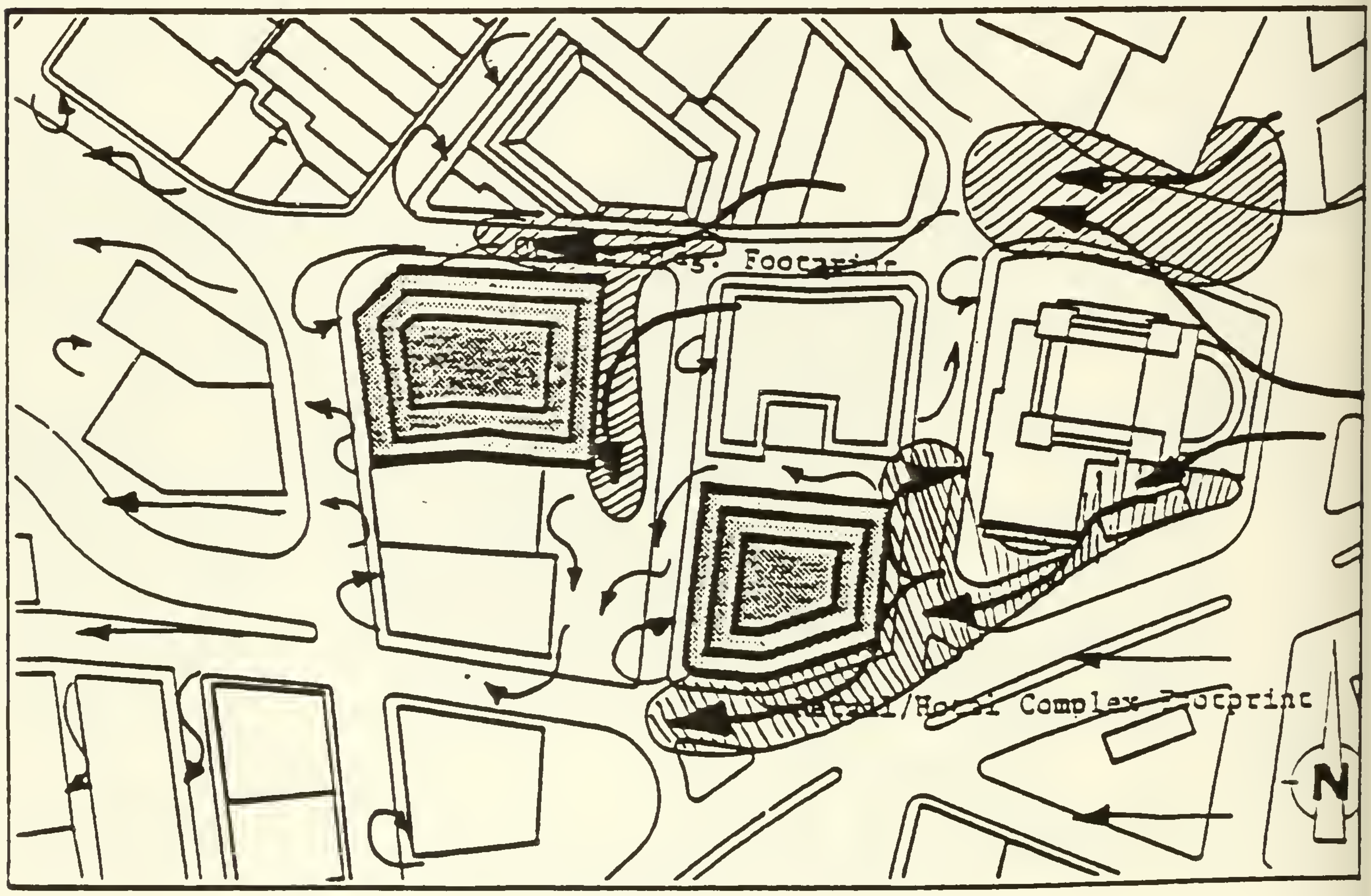
ALTERNATIVE 6

ACCELERATED FLOW REGION

Figure IV G-8:
Anticipated Wind Flow Patterns - Wind from the Northeast



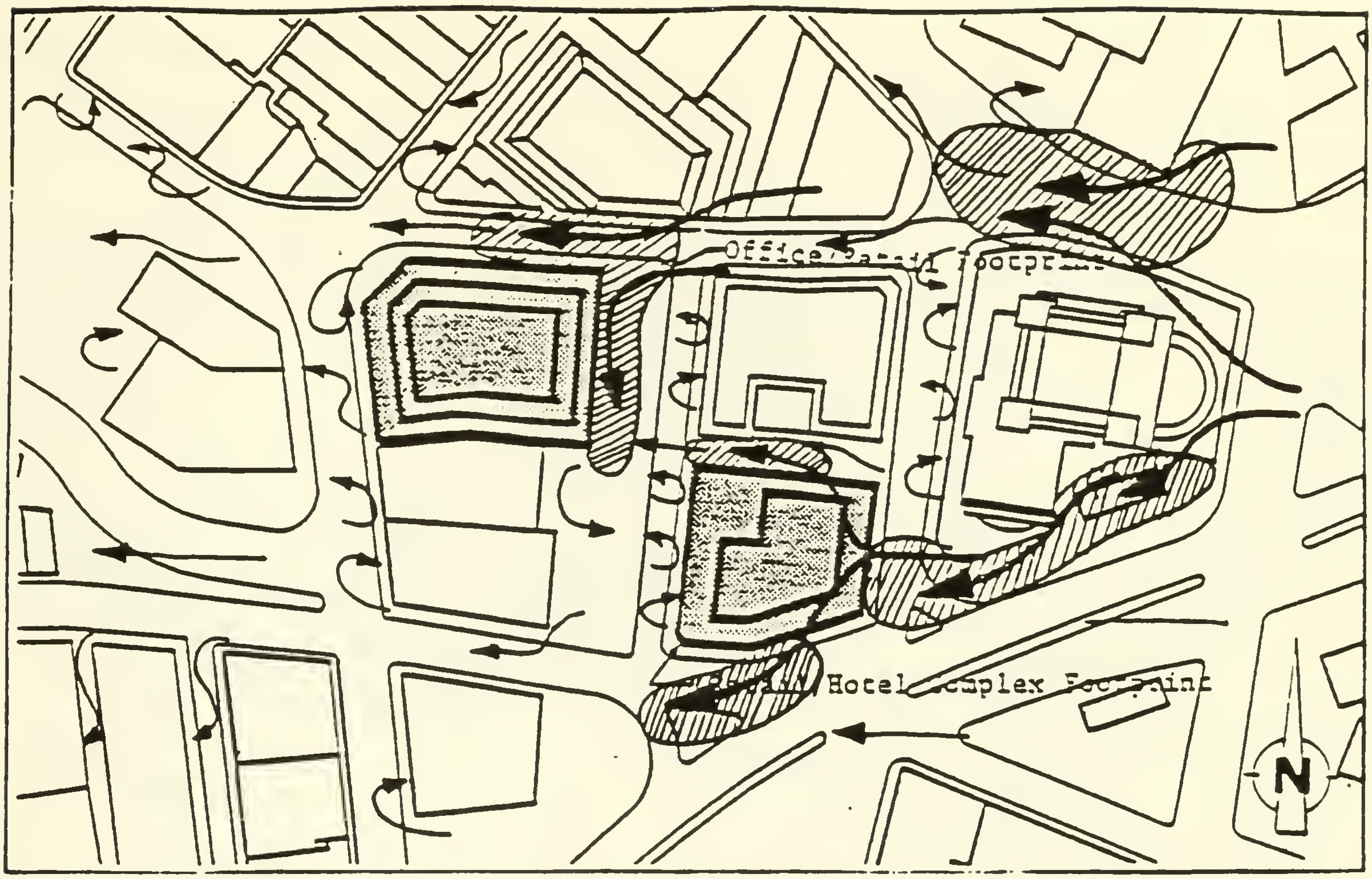
ALTERNATIVE 1



ALTERNATIVE 2

ACCELERATED FLOW RE[GION]

Figure IV G-9:
Anticipated Wind Flow Patterns - Wind from the East



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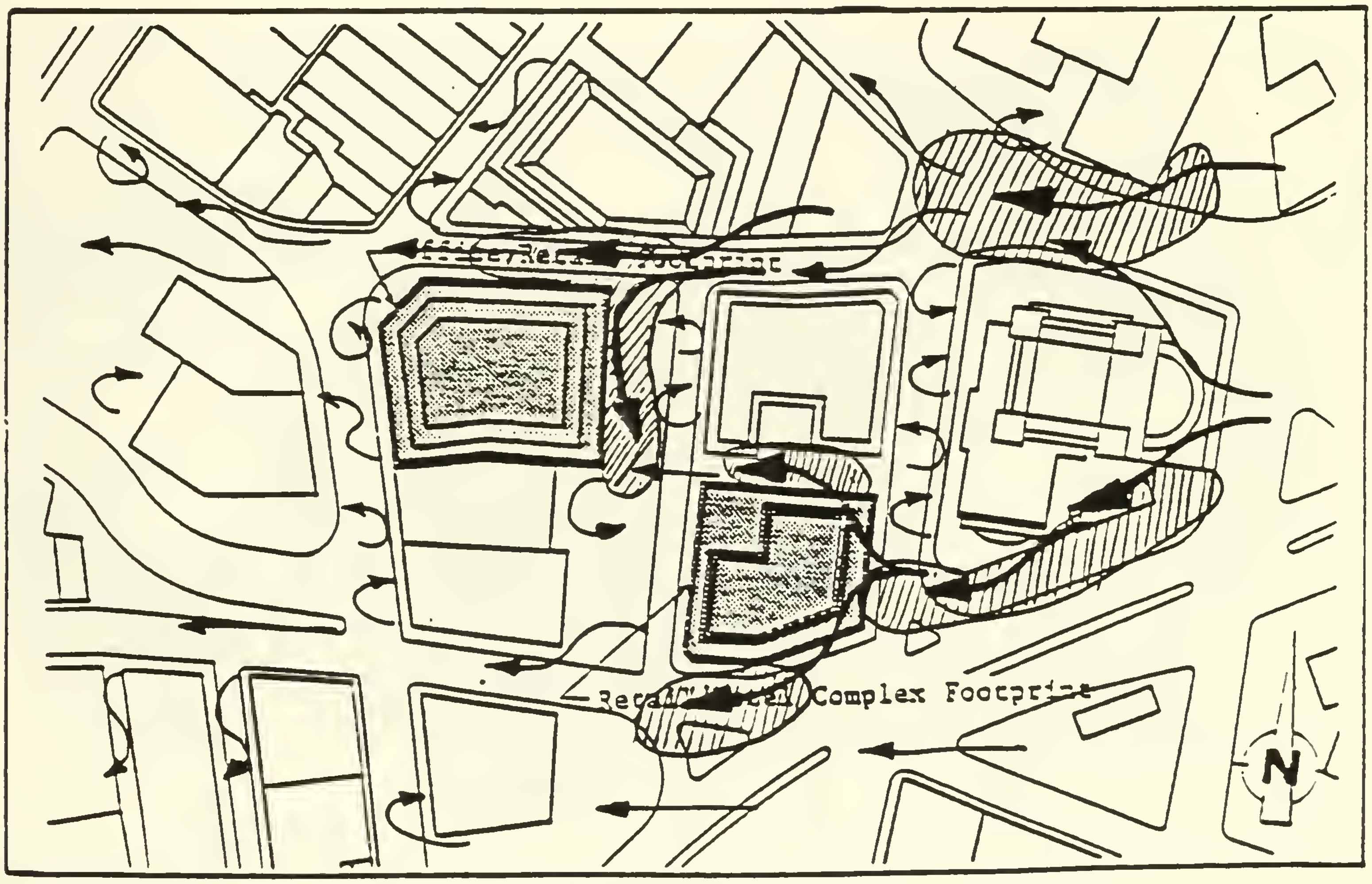
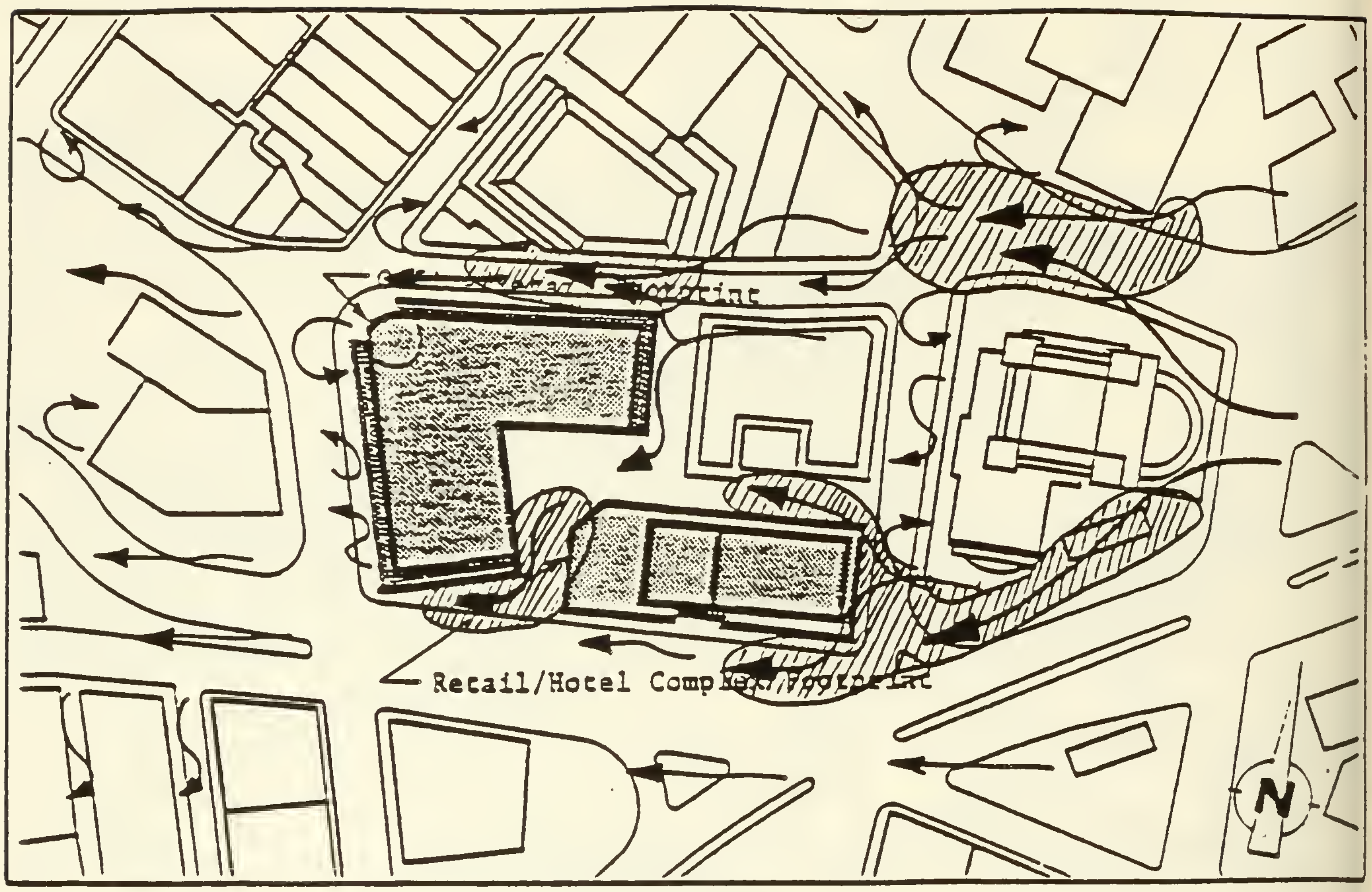


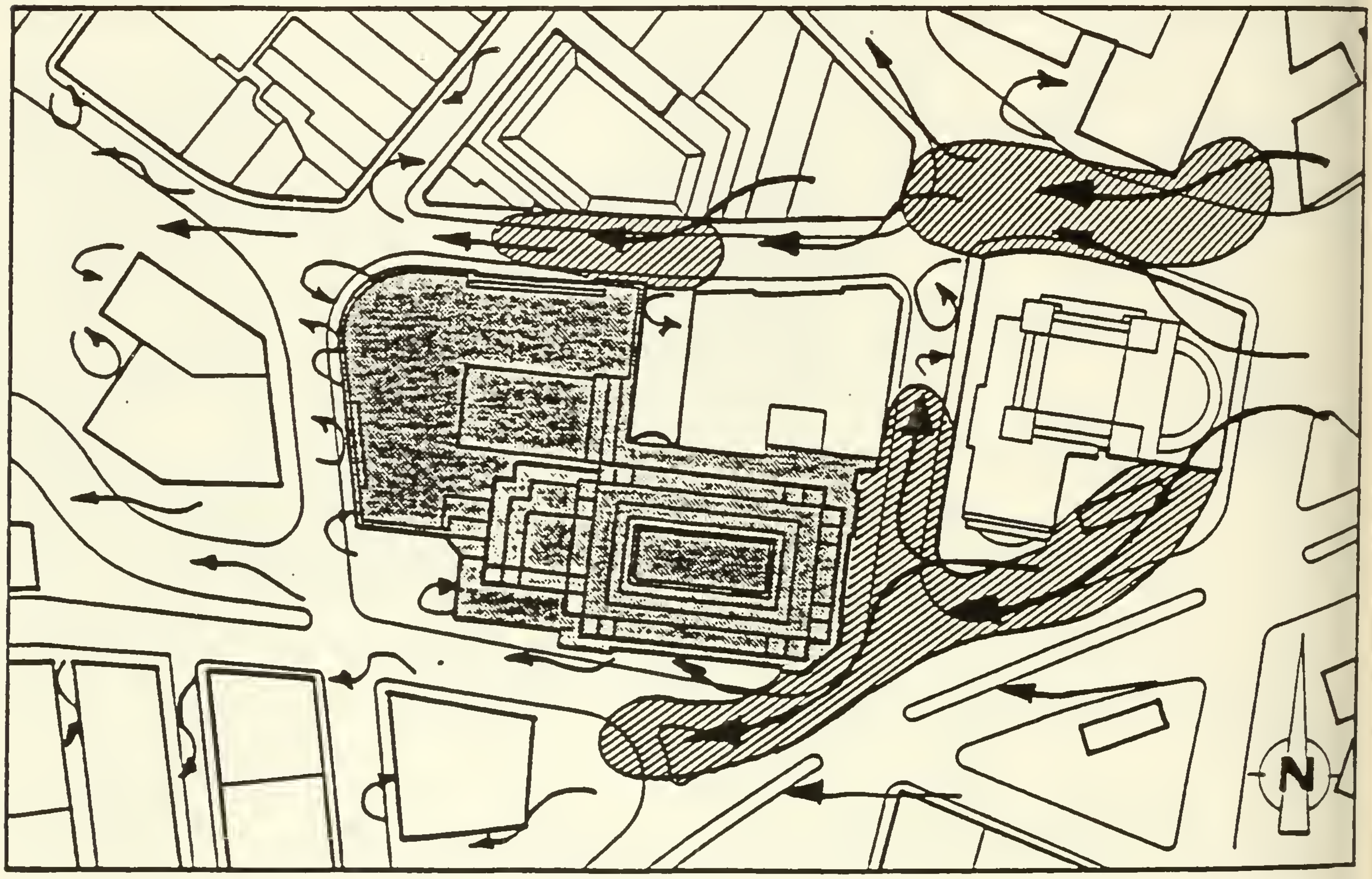
ALTERNATIVE 4

ACCELERATED FLOW REGION

Figure IV G-10:
Anticipated Wind Flow Patterns - Wind from the East



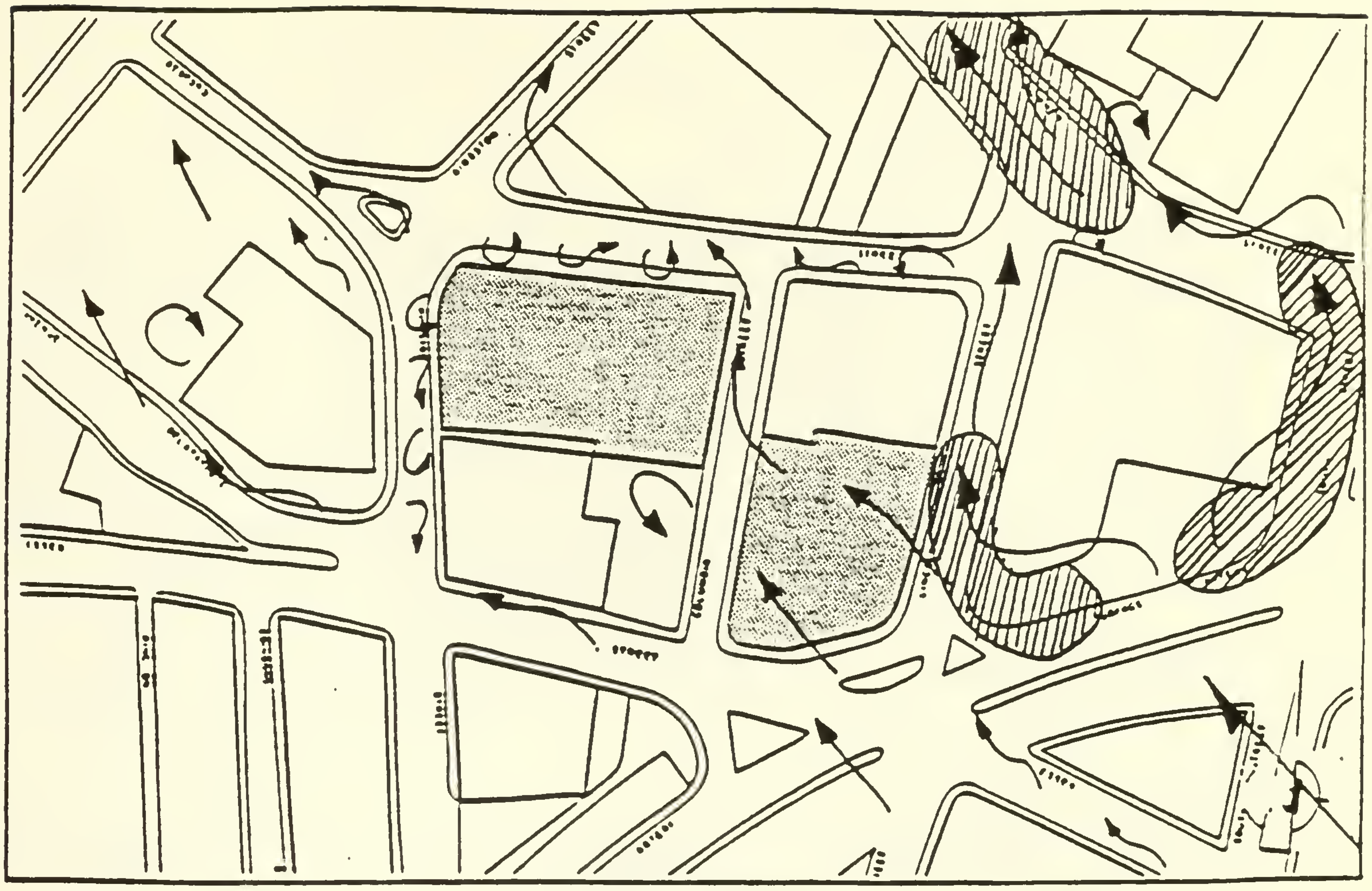
ALTERNATIVE 5



ALTERNATIVE 6

ACCELERATED FLOW REGN

Figure IV G-11:
Anticipated Wind Flow Patterns - Wind from the East



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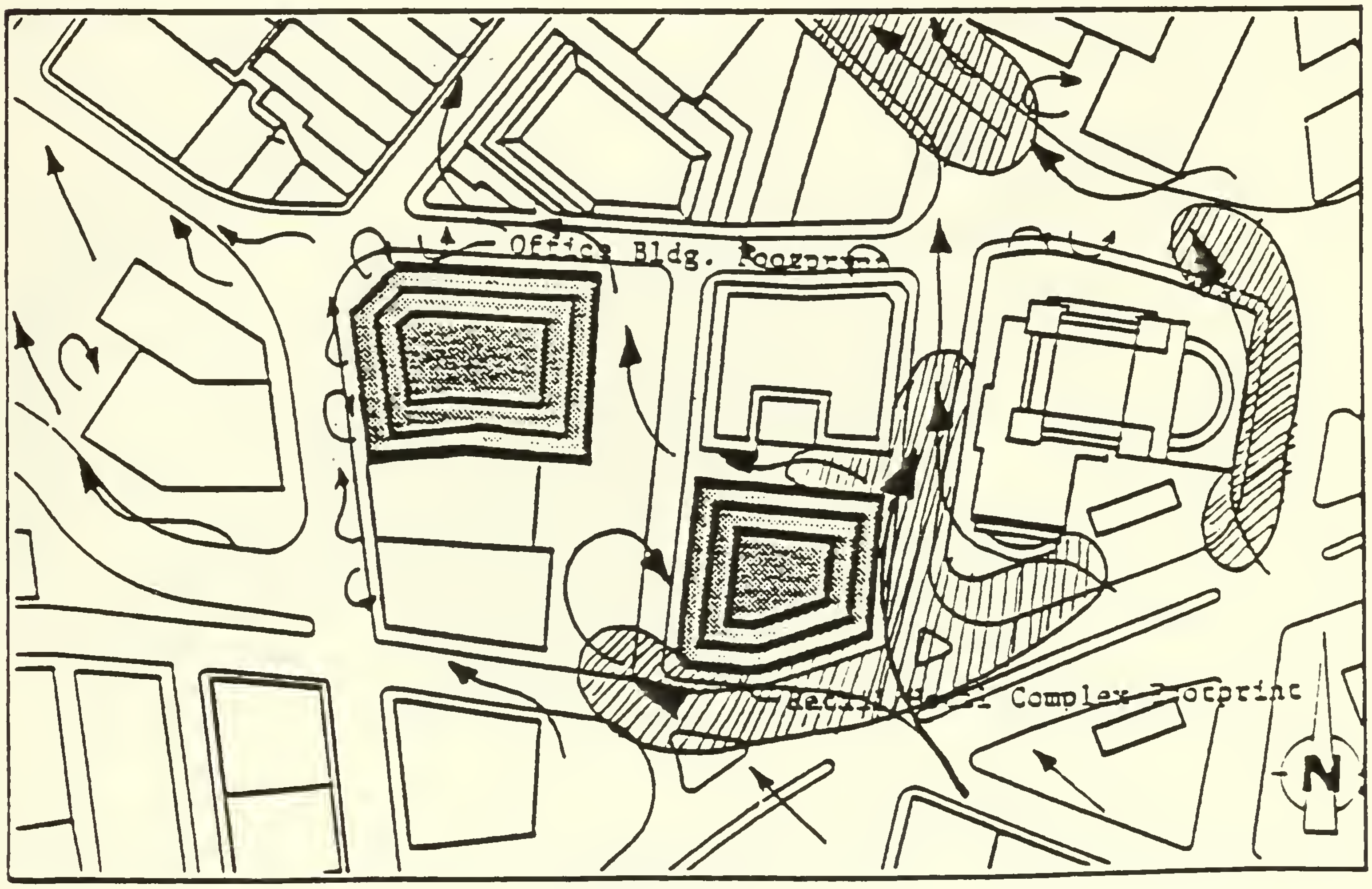
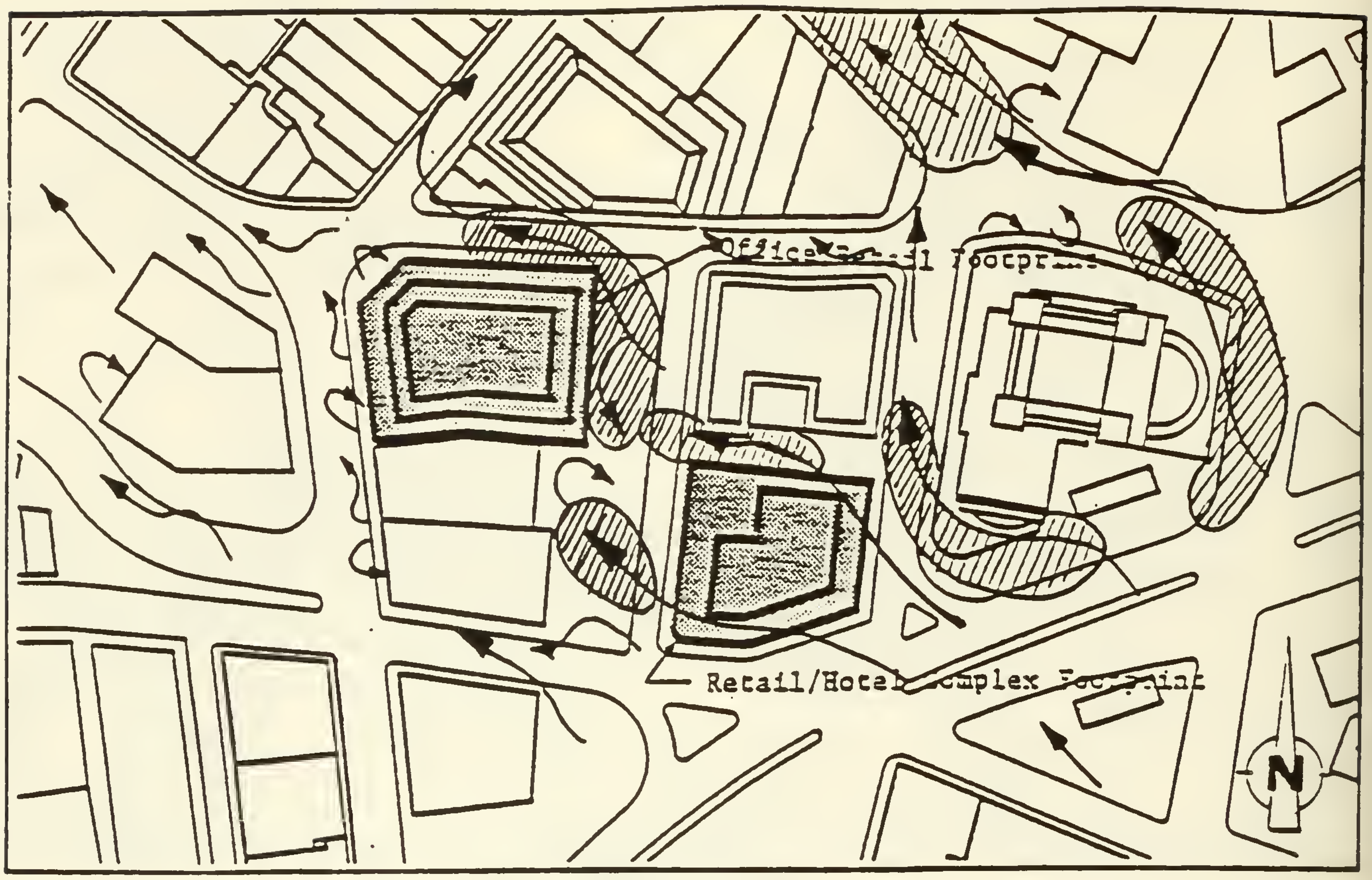


ALTERNATIVE 2

ACCELERATED FLOW REGION

Figure IV G-12:
Anticipated Wind Flow Patterns - Wind from the Southeast



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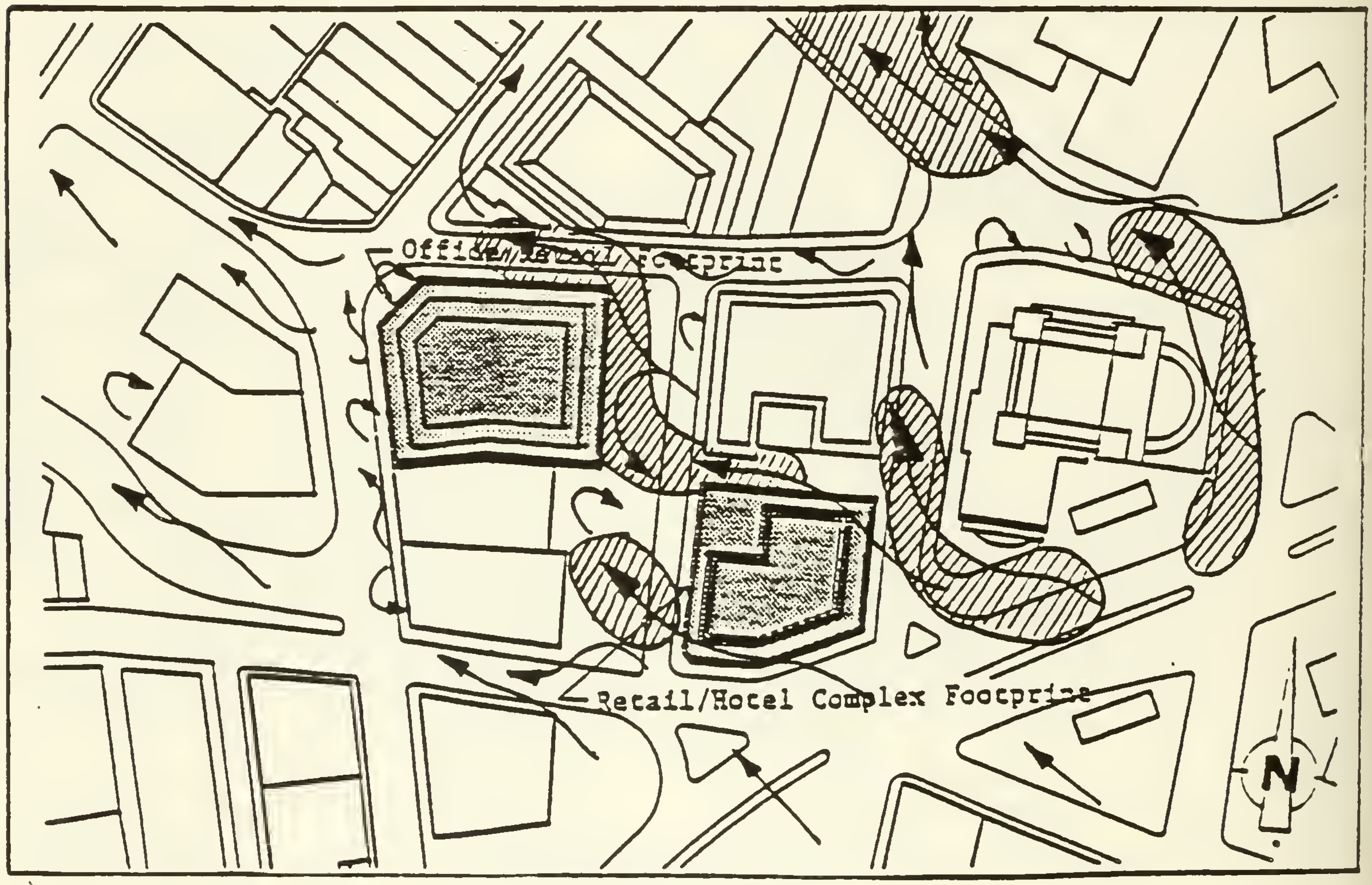


ALTERNATIVE 4

ACCELERATED FLOW REGN

Figure IV G-13:
Anticipated Wind Flow Patterns - Wind from the Southeast

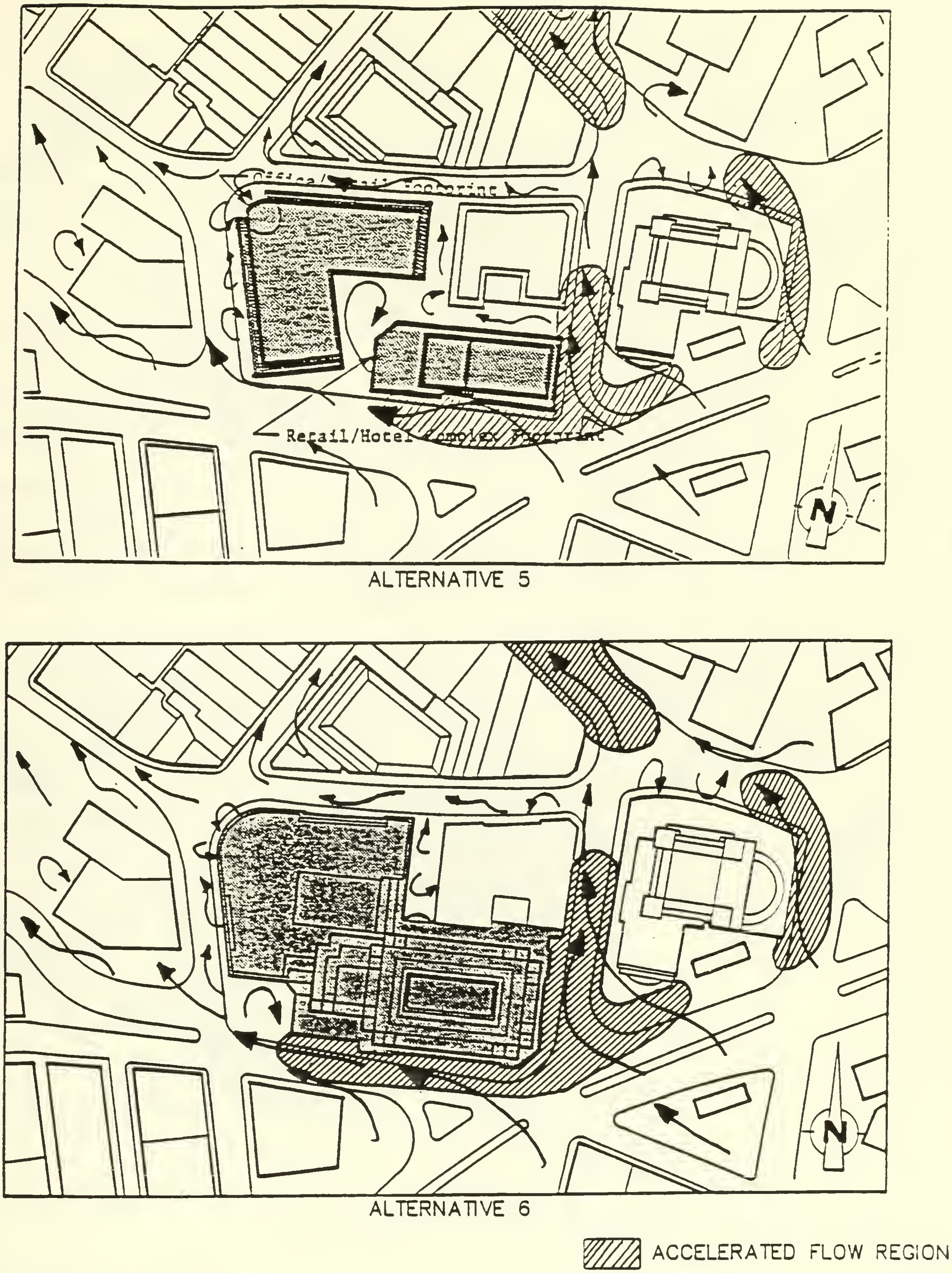
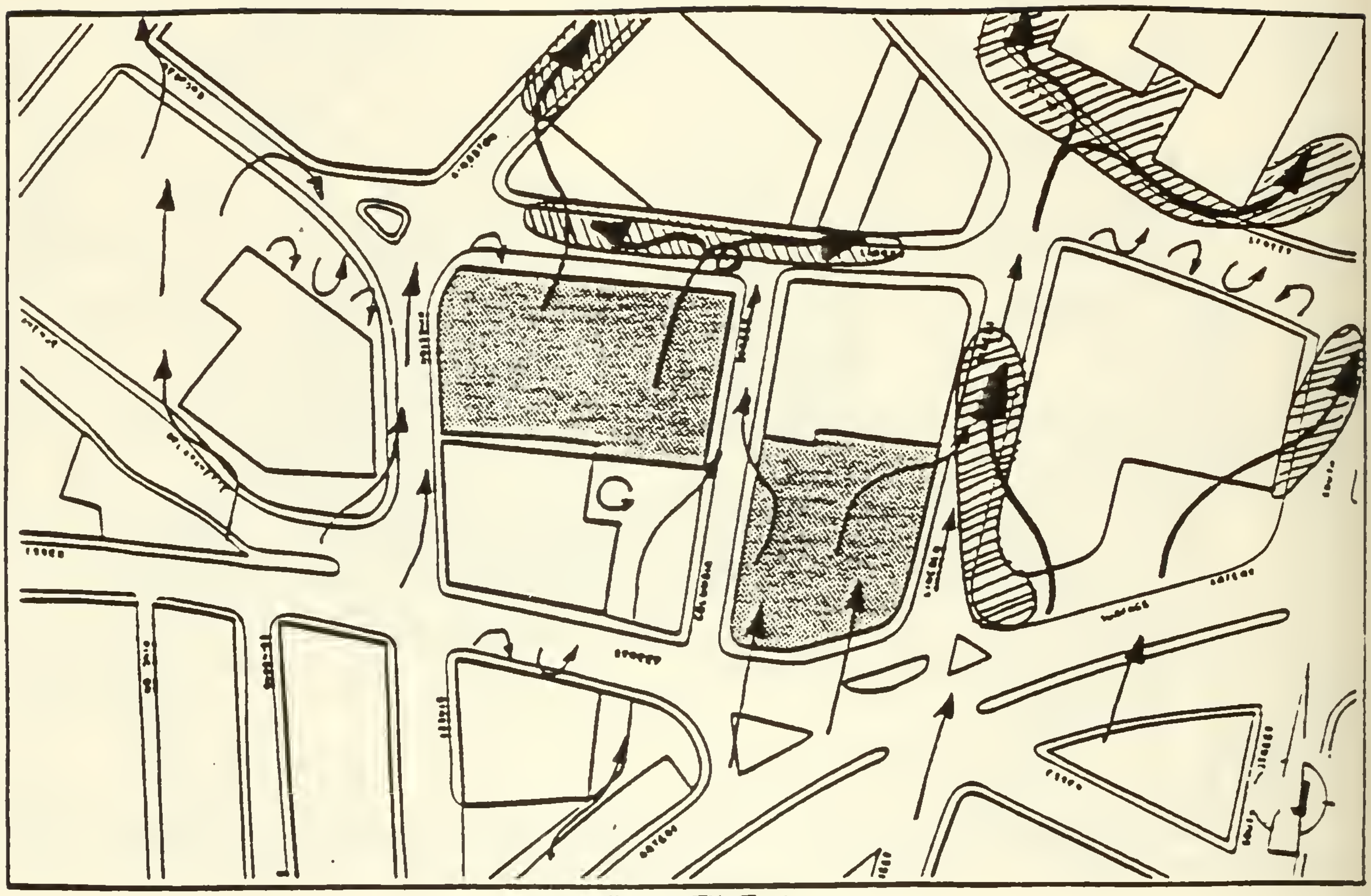


Figure IV G-14:
Anticipated Wind Flow Patterns - Wind from the Southeast



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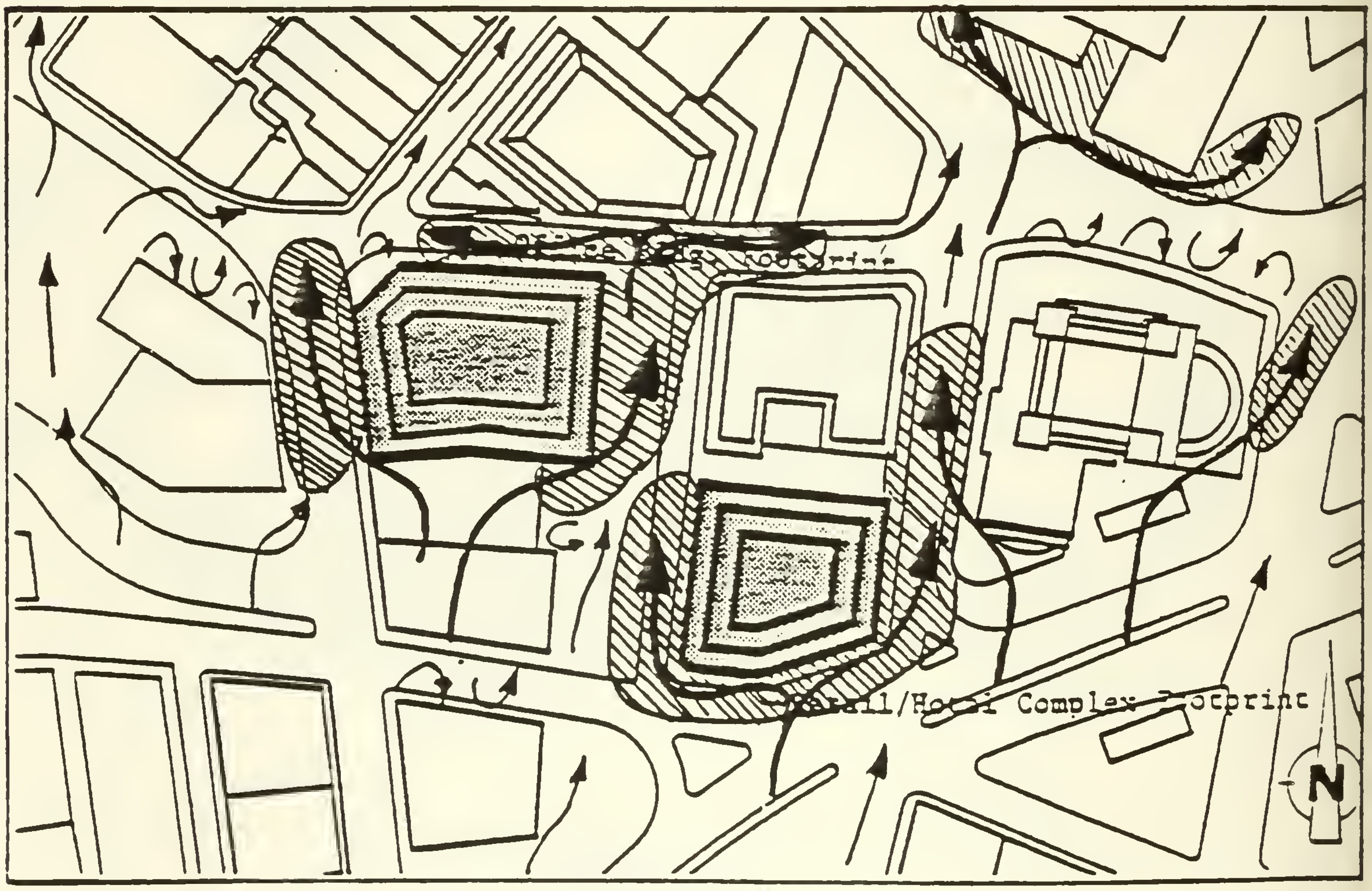
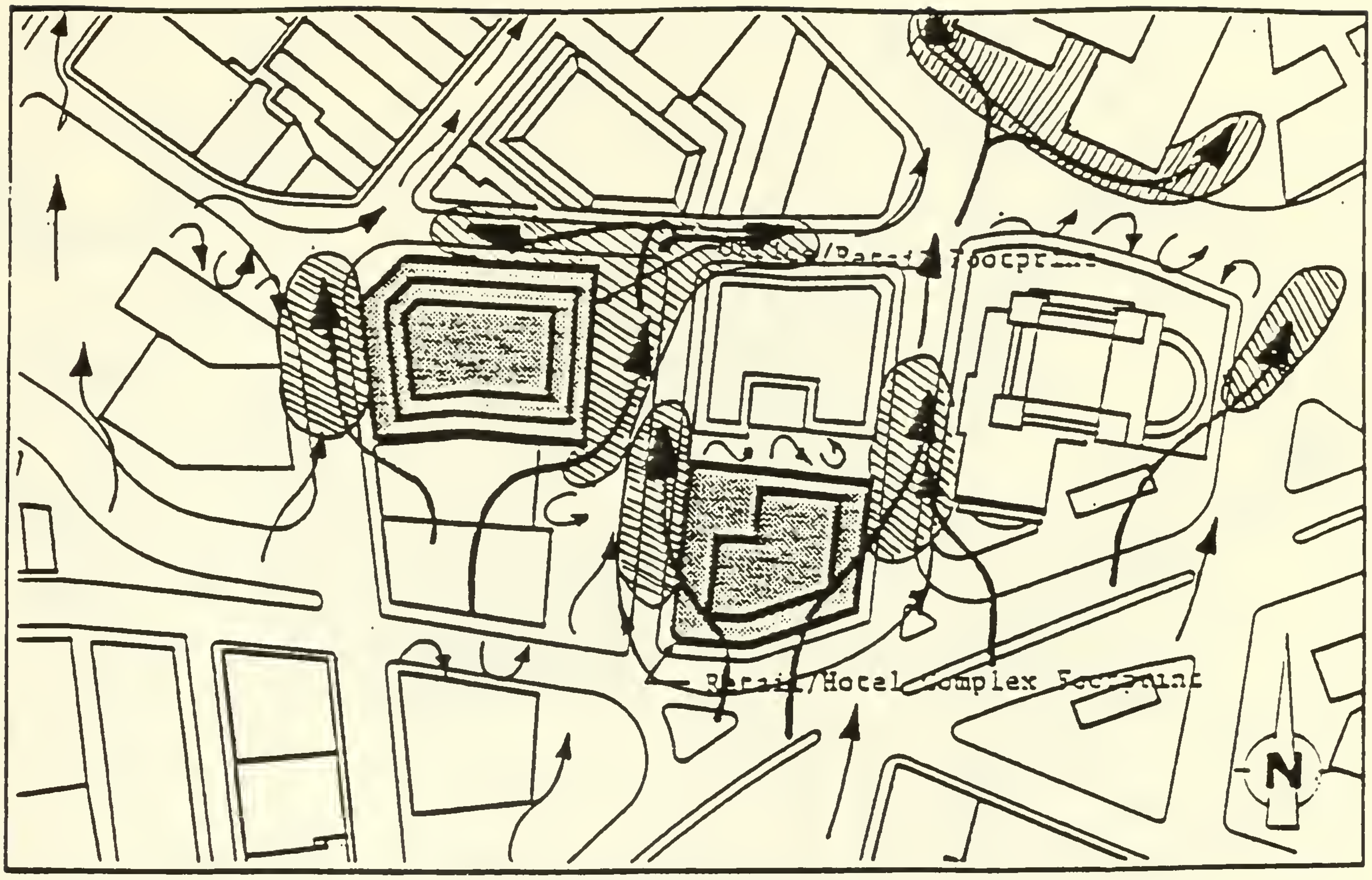


ALTERNATIVE 2

ACCELERATED FLOW REGIN

Figure IV G-15:
Anticipated Wind Flow Patterns - Wind from the South



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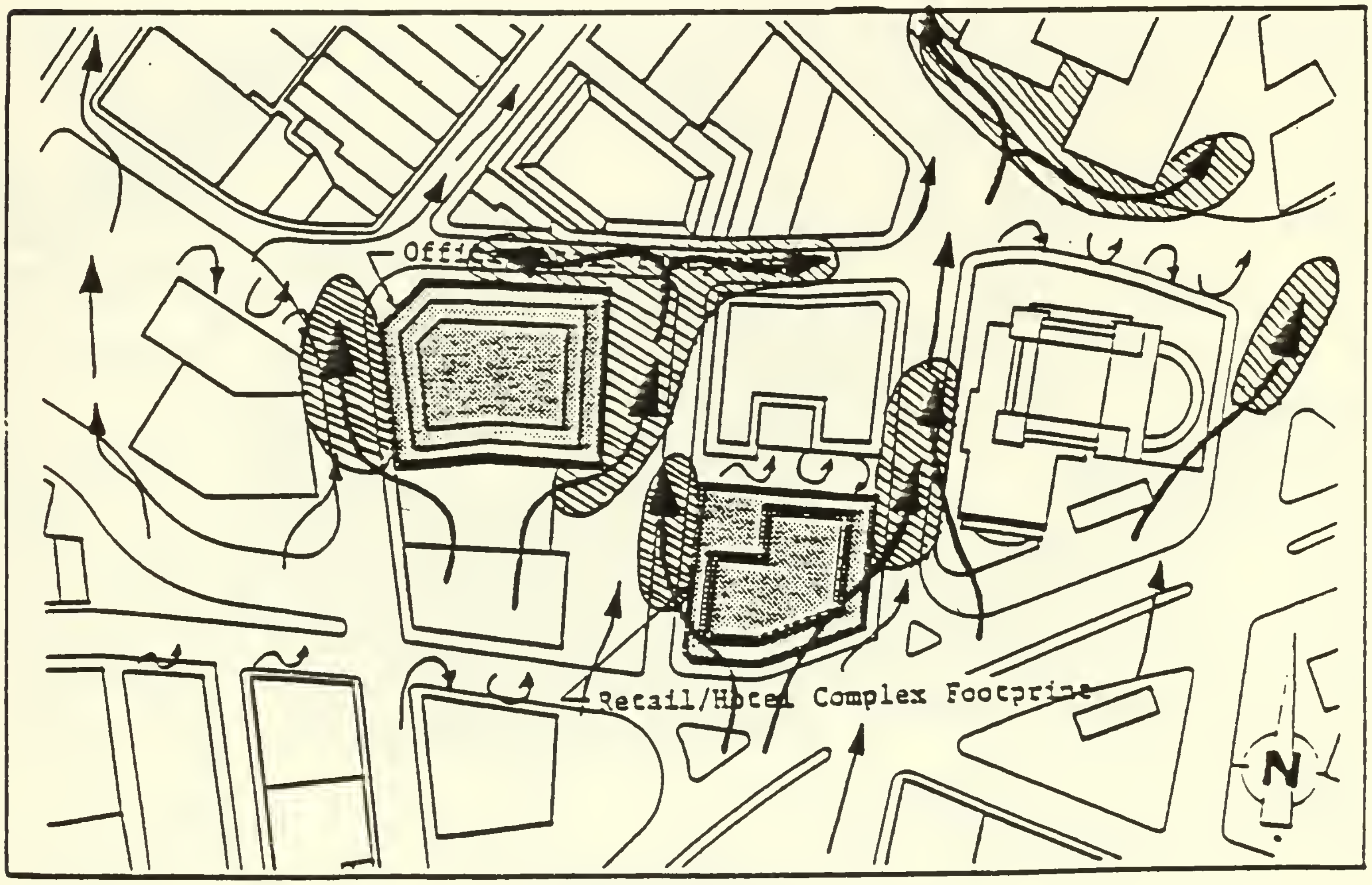
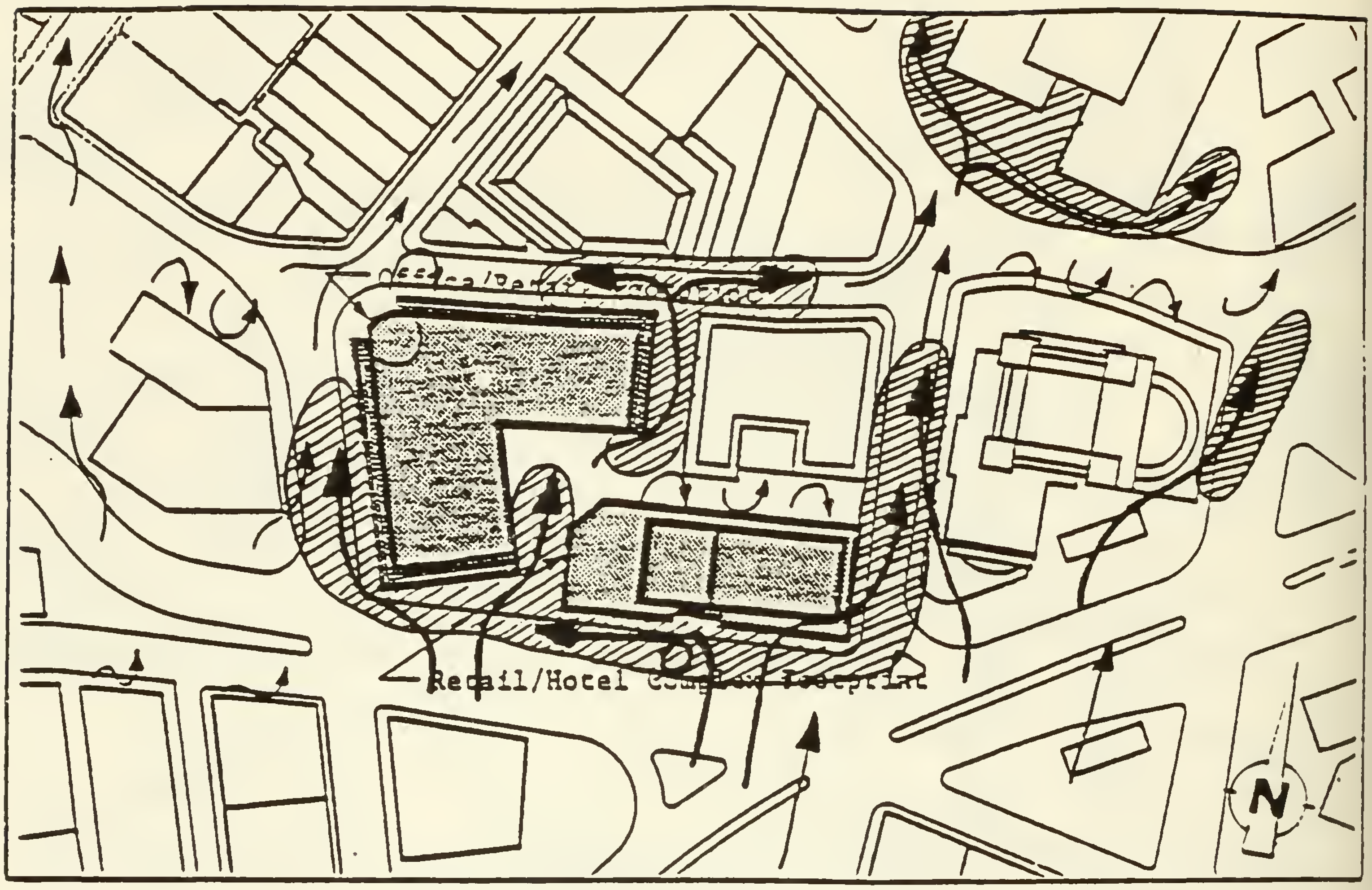


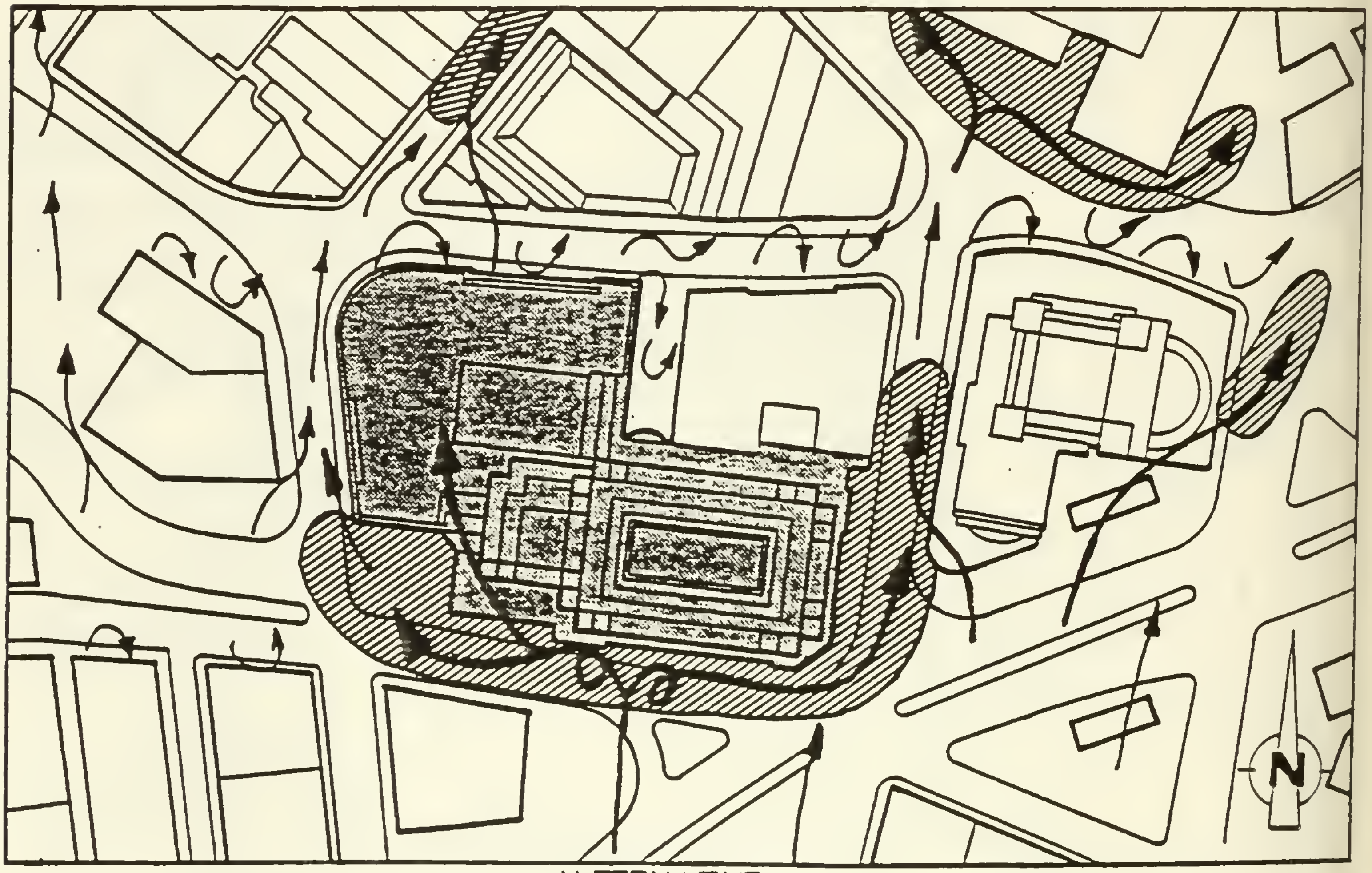
ALTERNATIVE 4

ACCELERATED FLOW REGION

Figure IV G-16:
Anticipated Wind Flow Patterns - Wind from the South



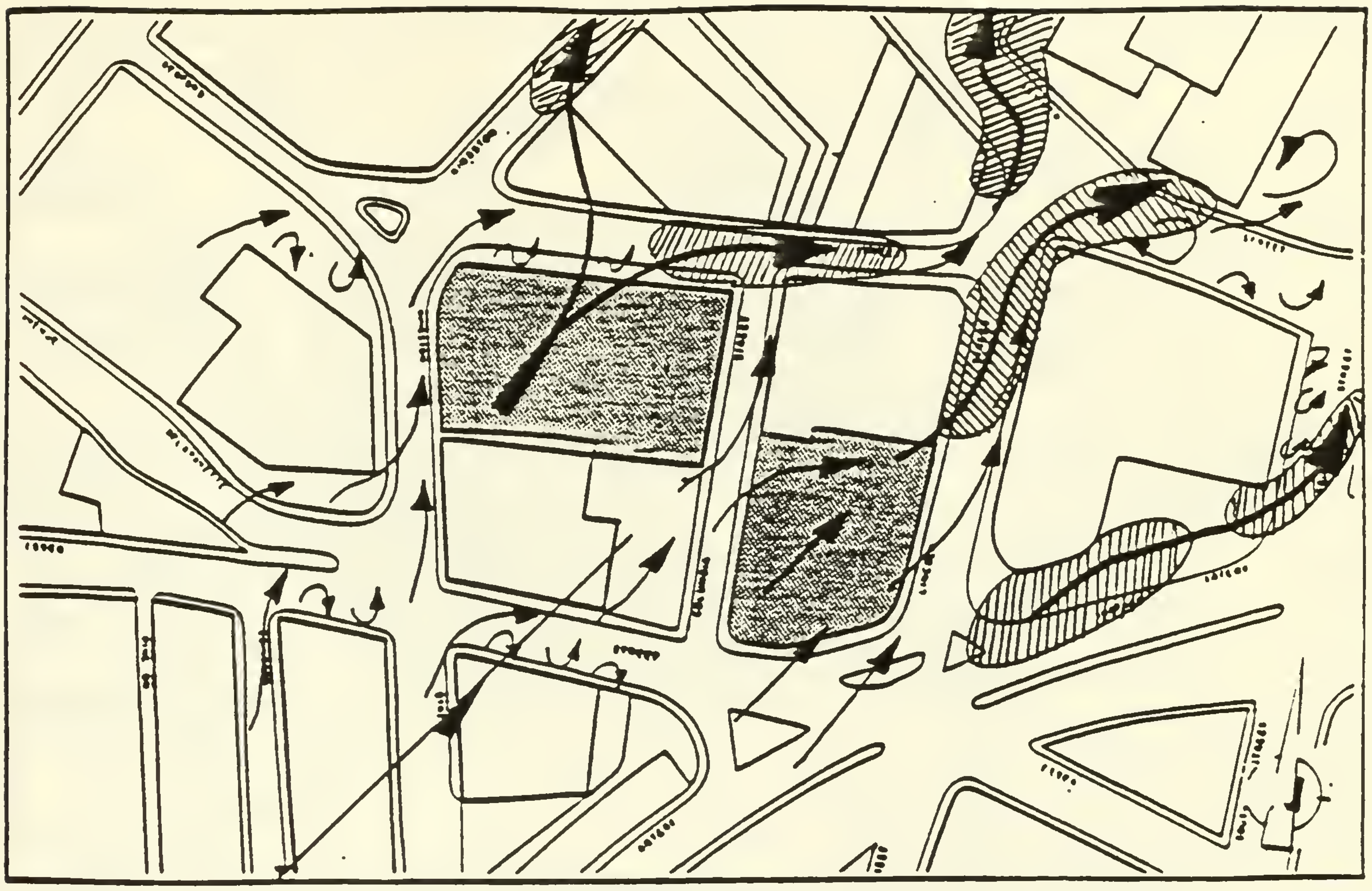
ALTERNATIVE 5



ALTERNATIVE 6

ACCELERATED FLOW REGIN

Figure IV G-17:
Anticipated Wind Flow Patterns - Wind from the South



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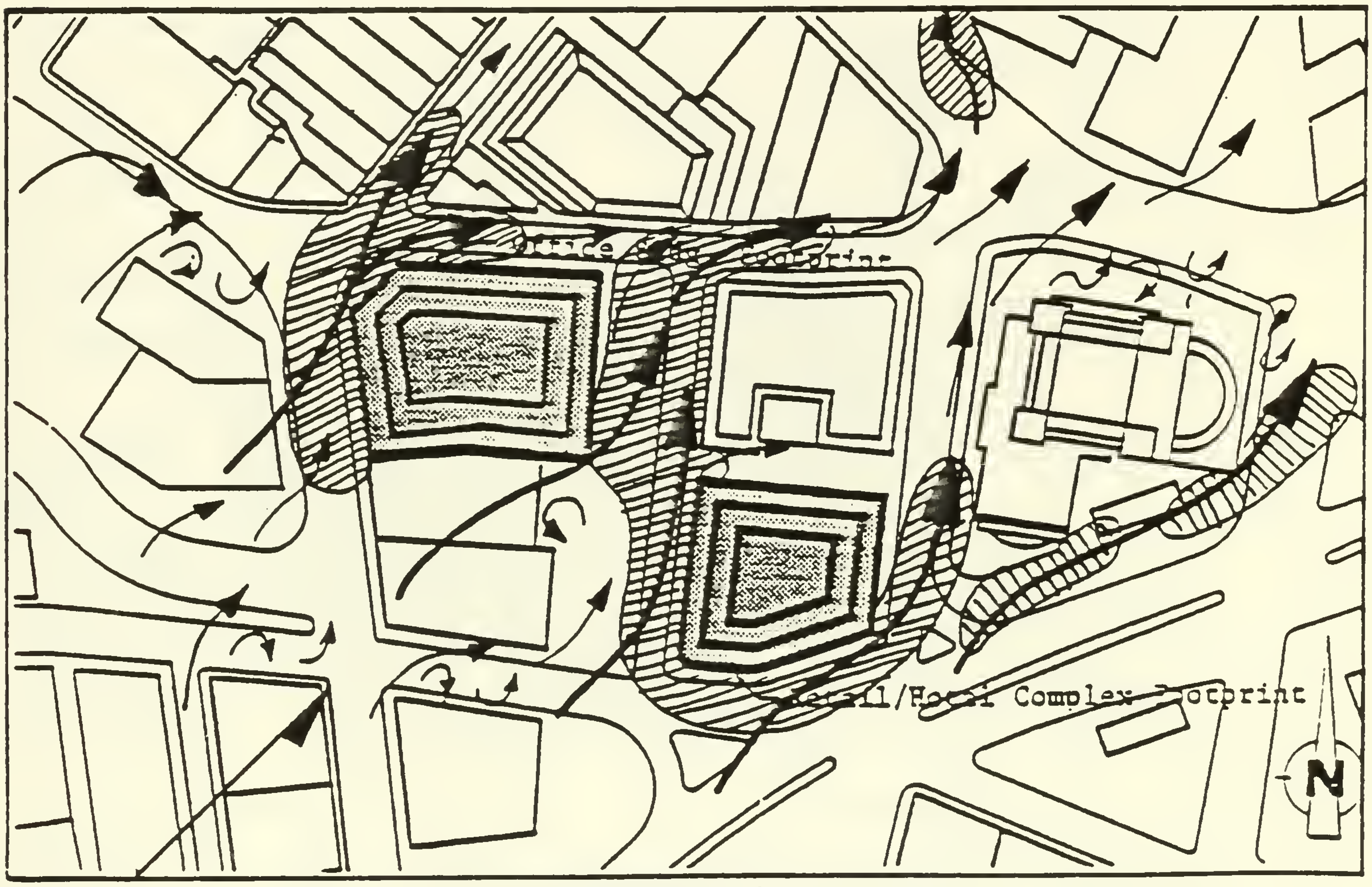

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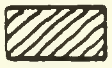
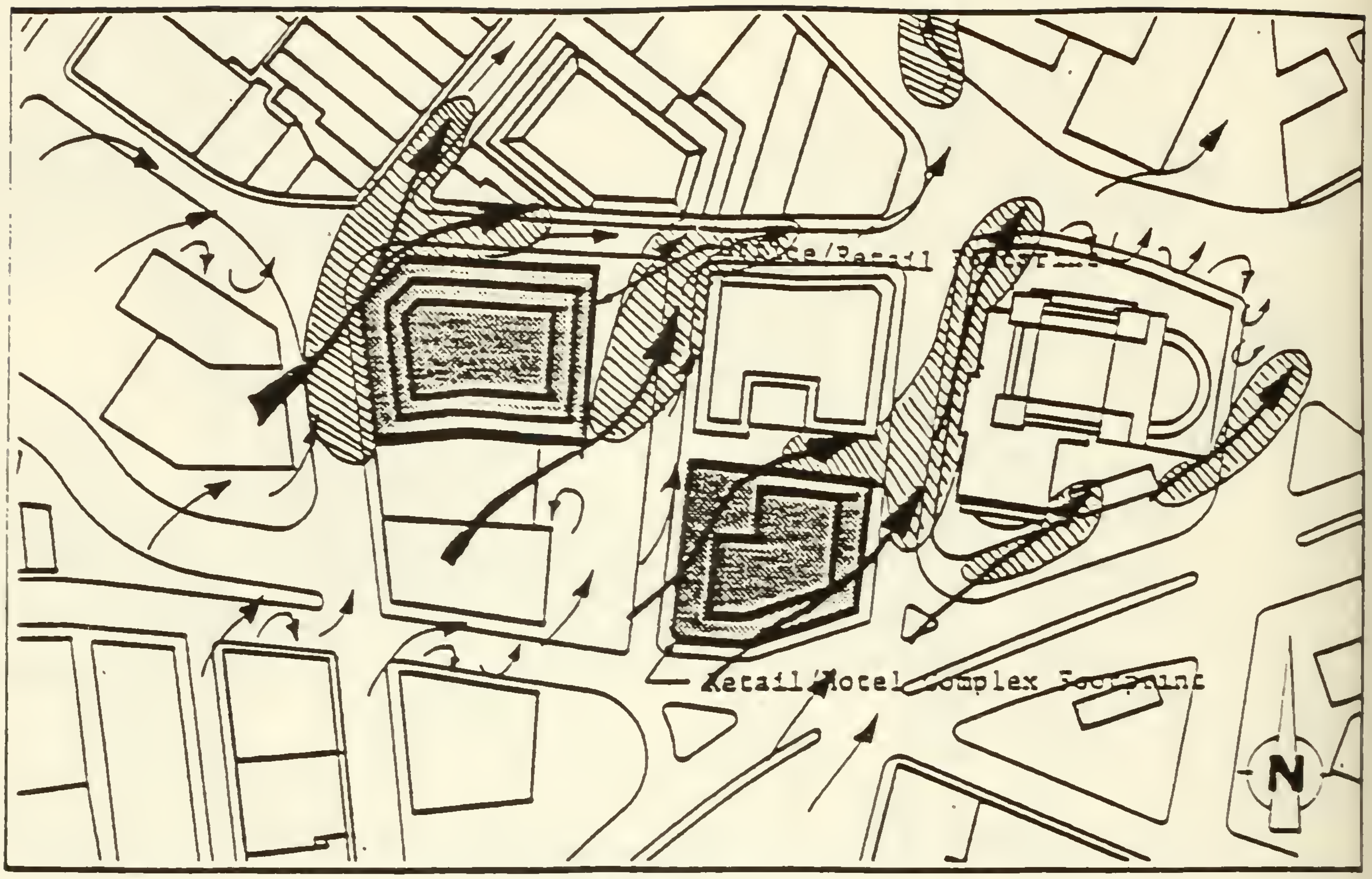


Figure IV G-18:
Anticipated Wind Flow Patterns - Wind from the Southwest



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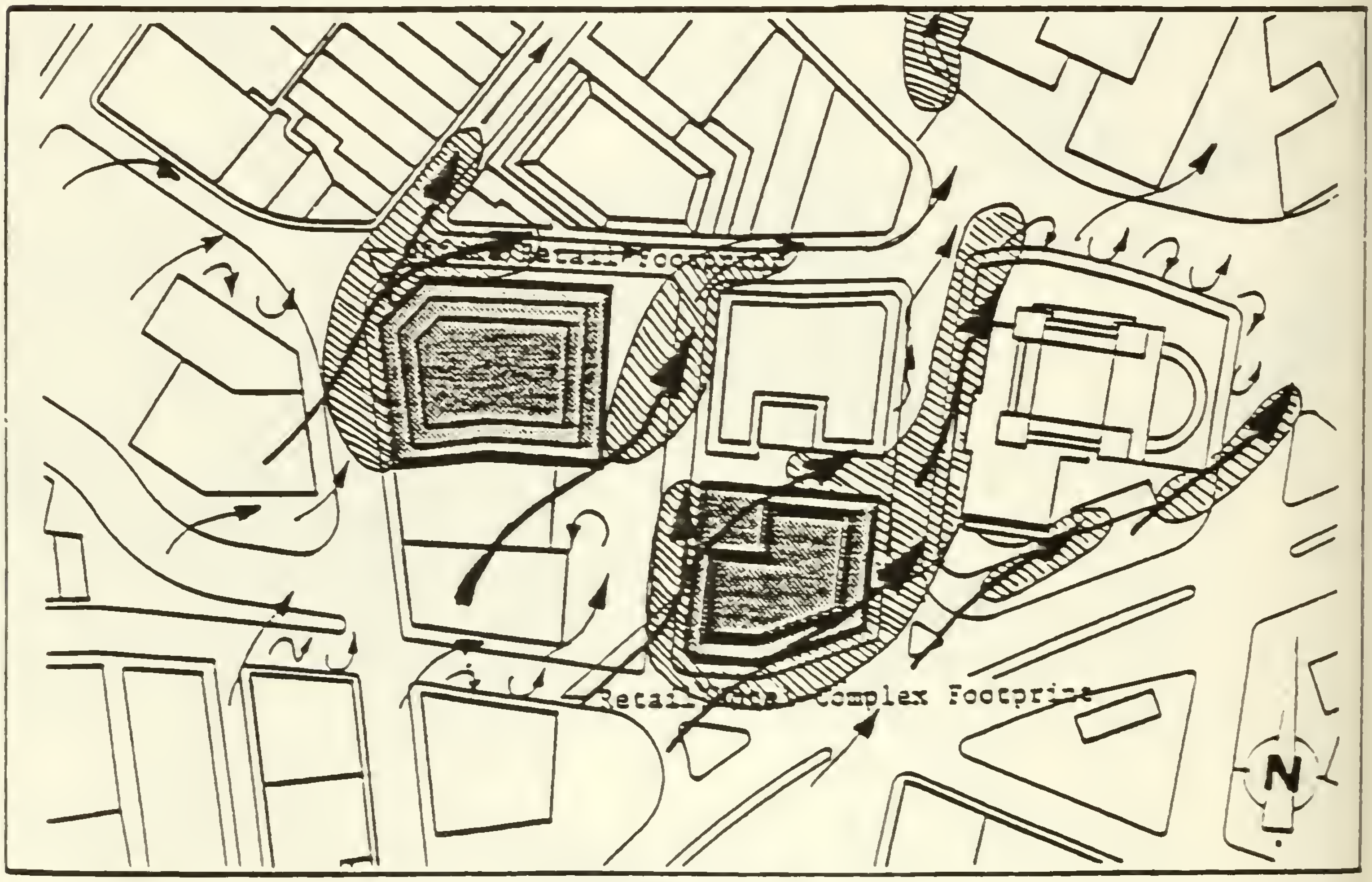
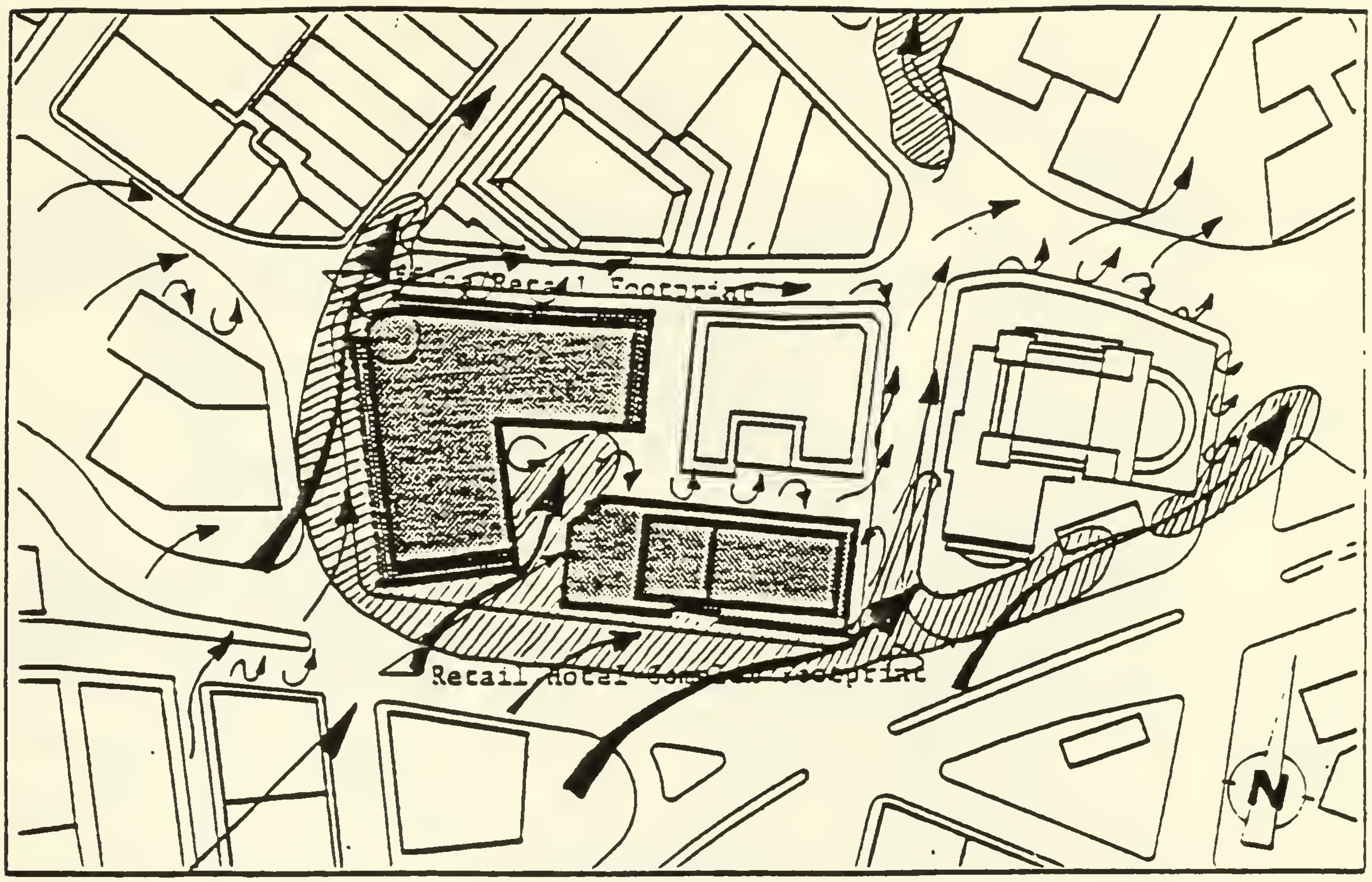


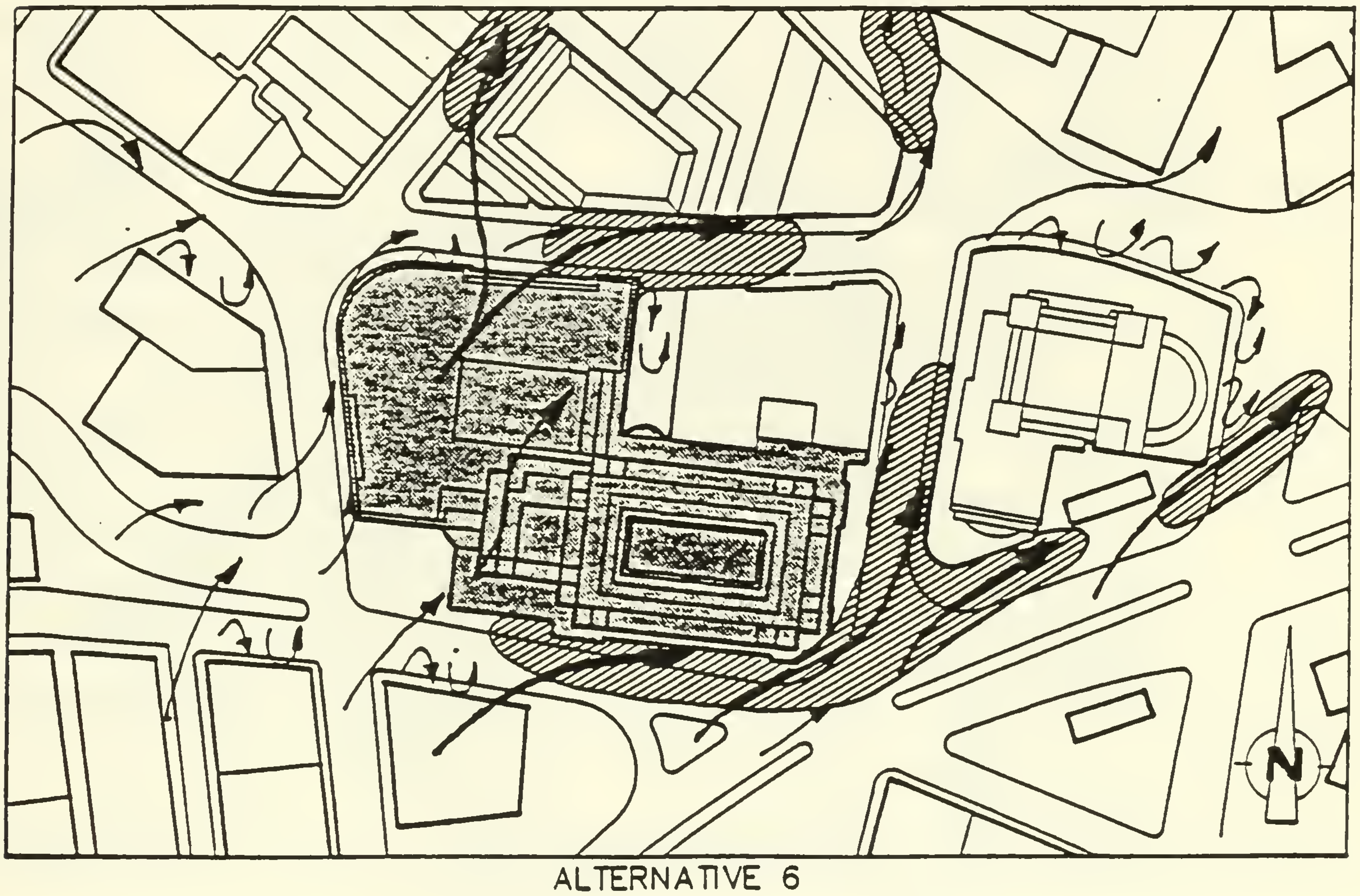
ALTERNATIVE 4

ACCELERATED FLOW REG

Figure IV G-19:
Anticipated Wind Flow Patterns - Wind from the Southwest



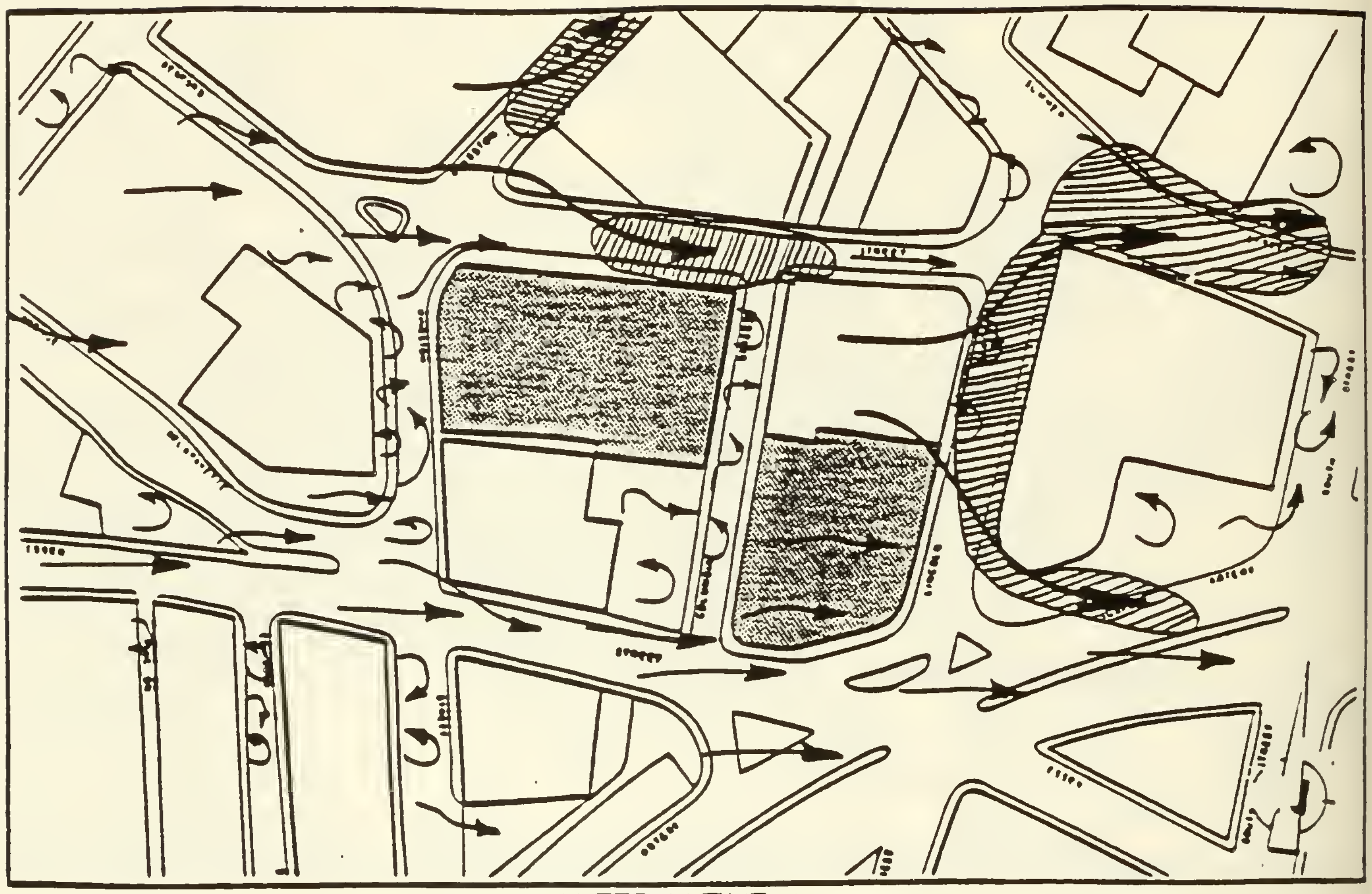
ALTERNATIVE 5



ALTERNATIVE 6

ACCELERATED FLOW REGION

Figure IV G-20:
Anticipated Wind Flow Patterns - Wind from the Southwest



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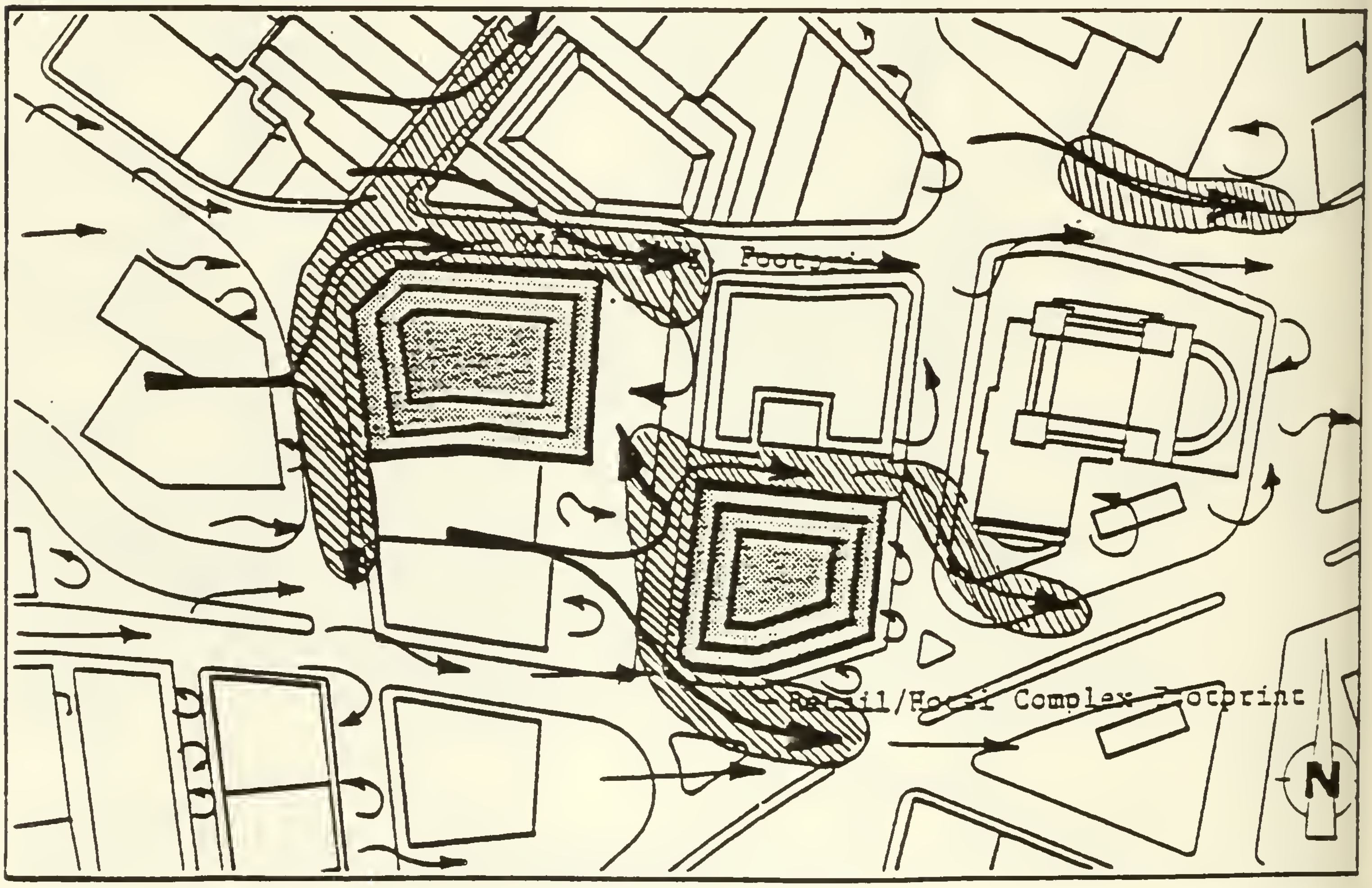
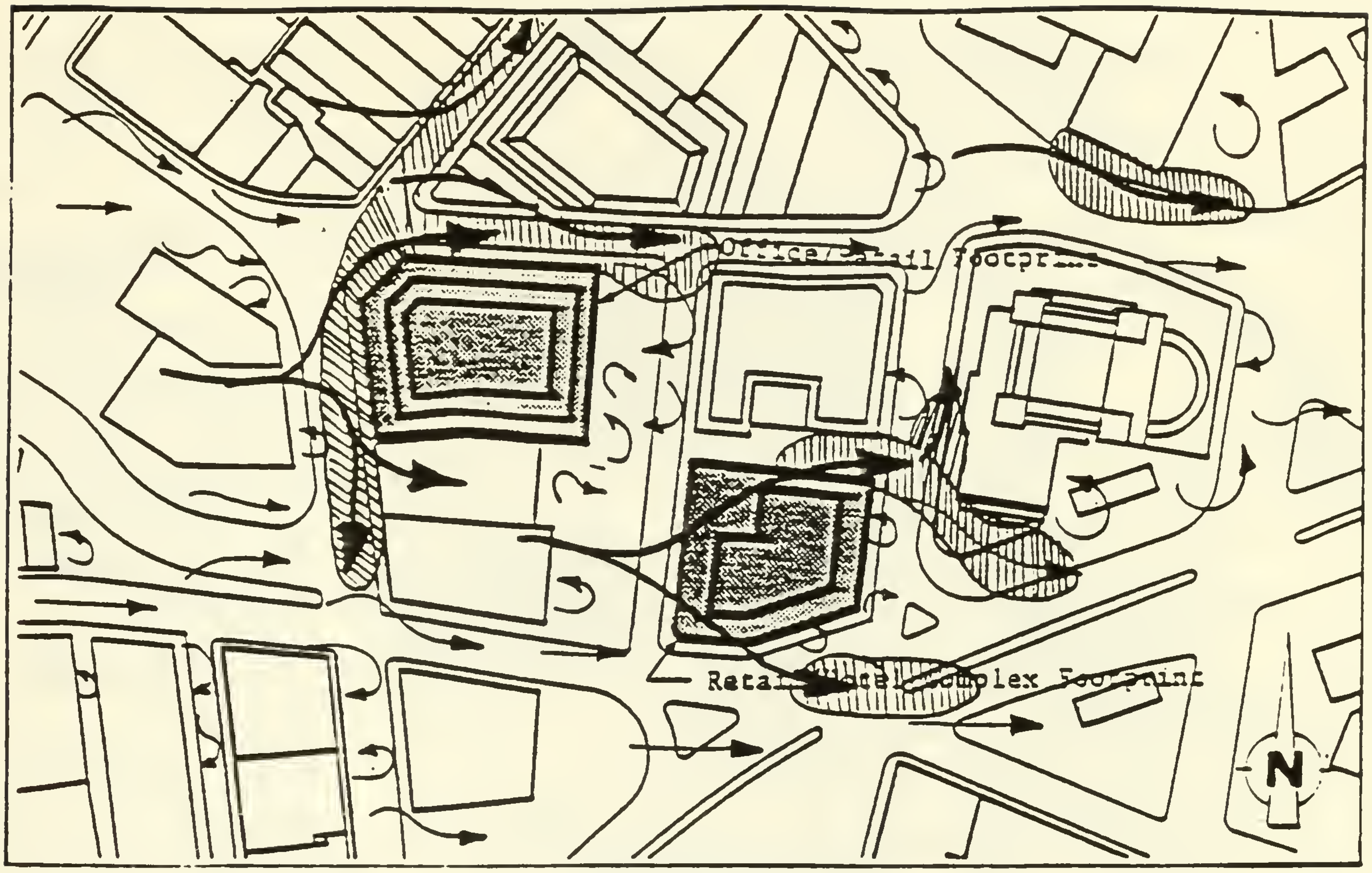


ALTERNATIVE 2

ACCELERATED FLOW RE

Figure IV G-21:
Anticipated Wind Flow Patterns - Wind from the West



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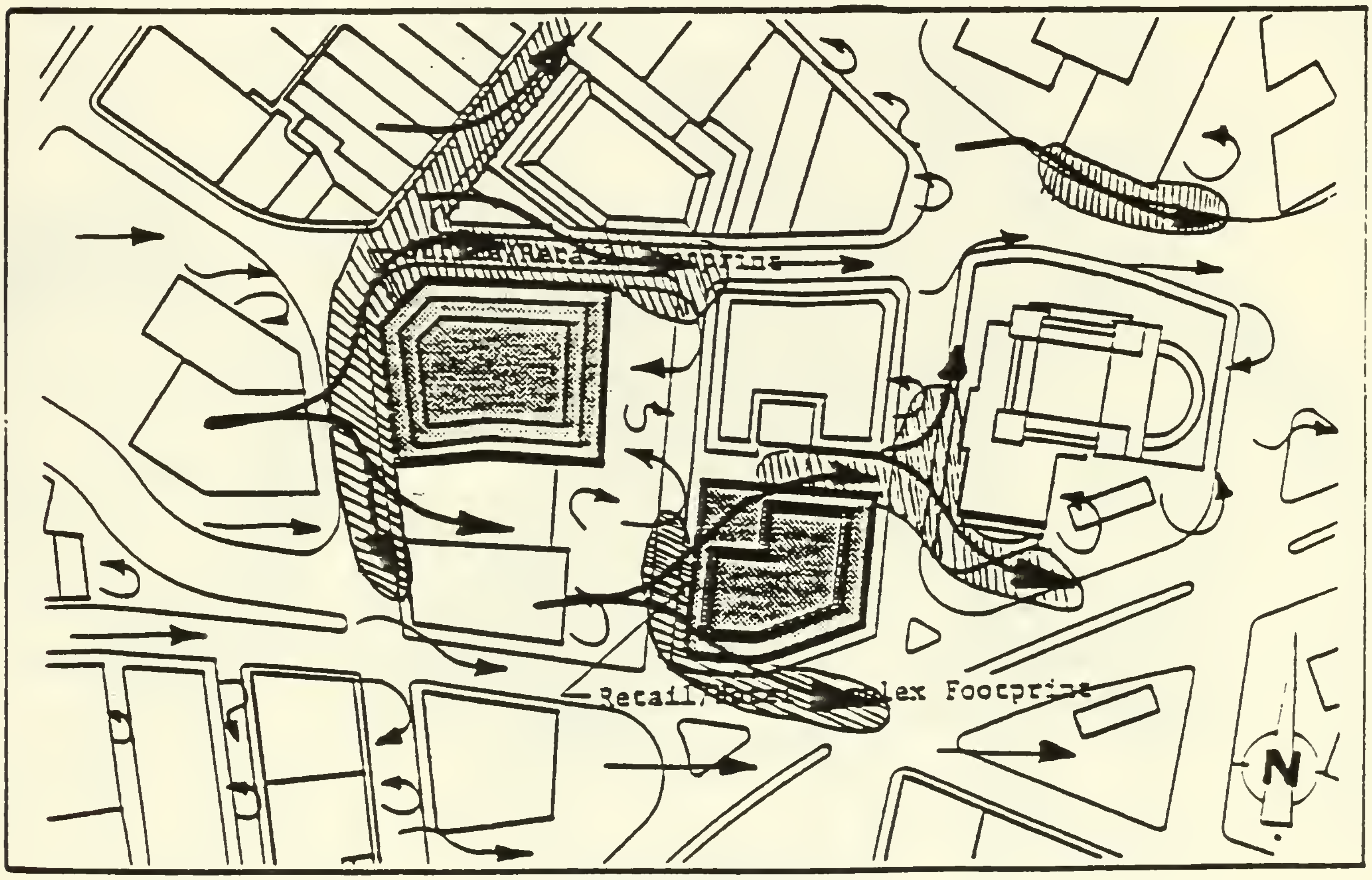
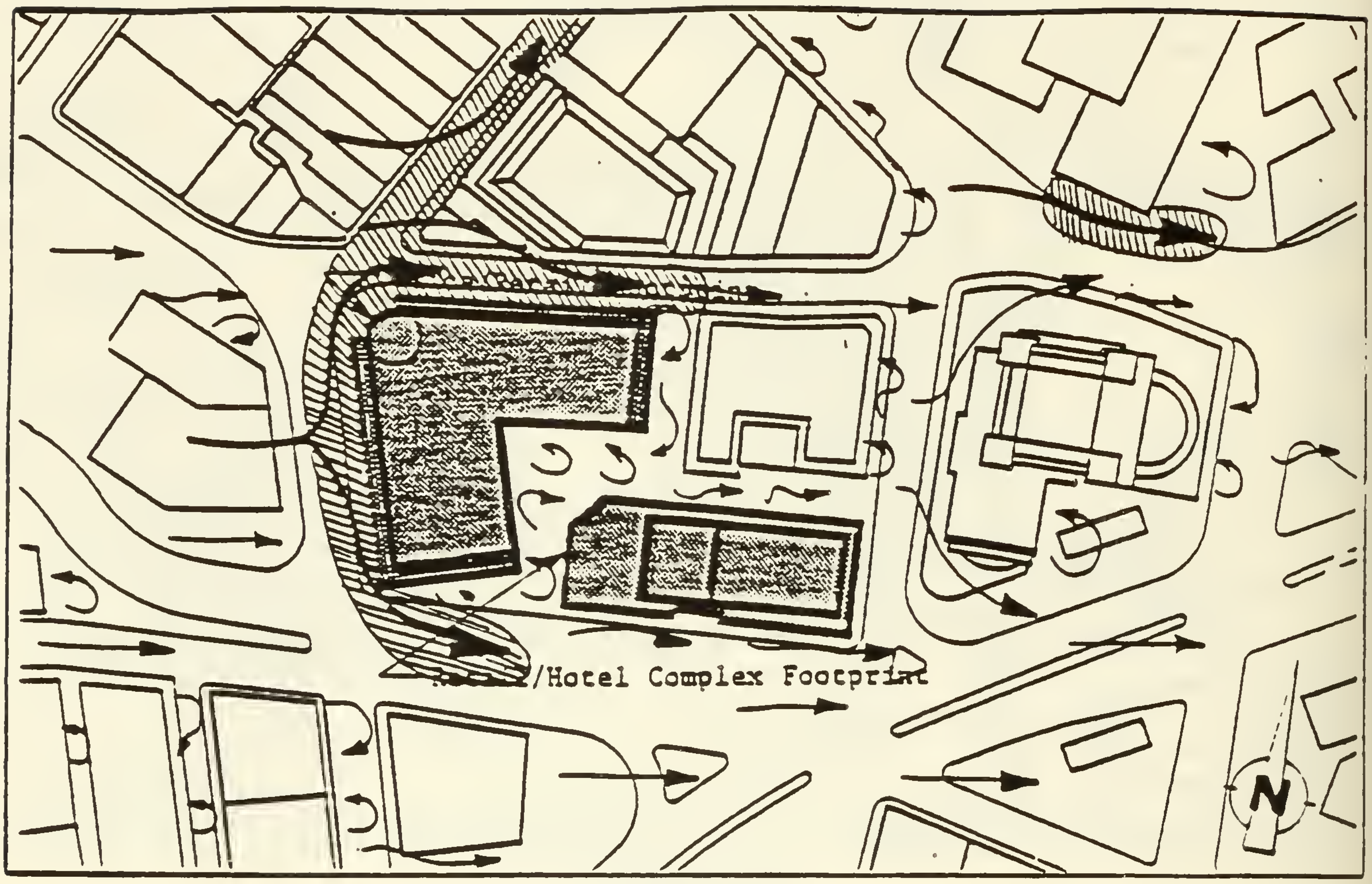


ALTERNATIVE 4

ACCELERATED FLOW REGION

Figure IV G-22:
Anticipated Wind Flow Patterns - Wind from the West



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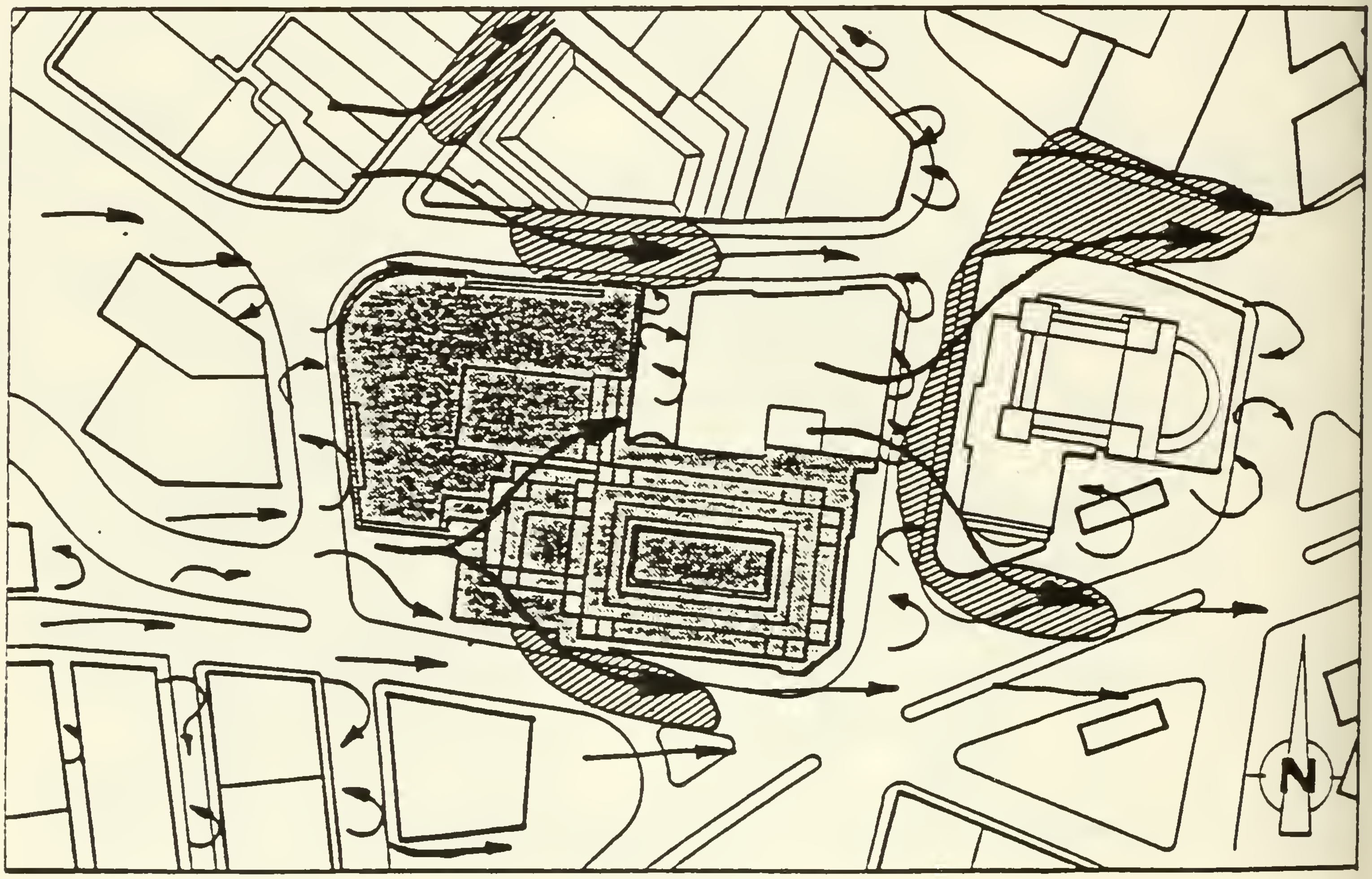
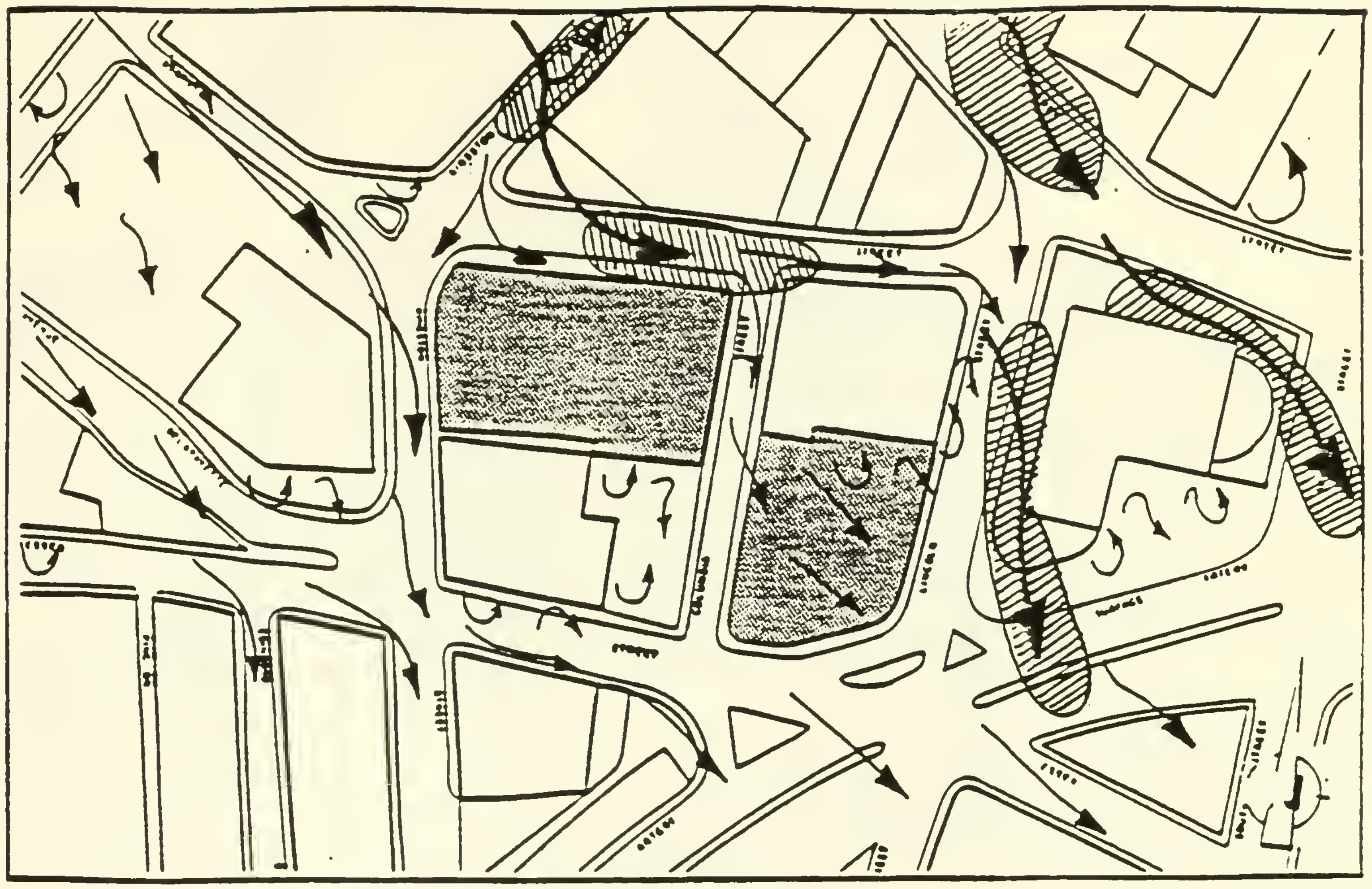


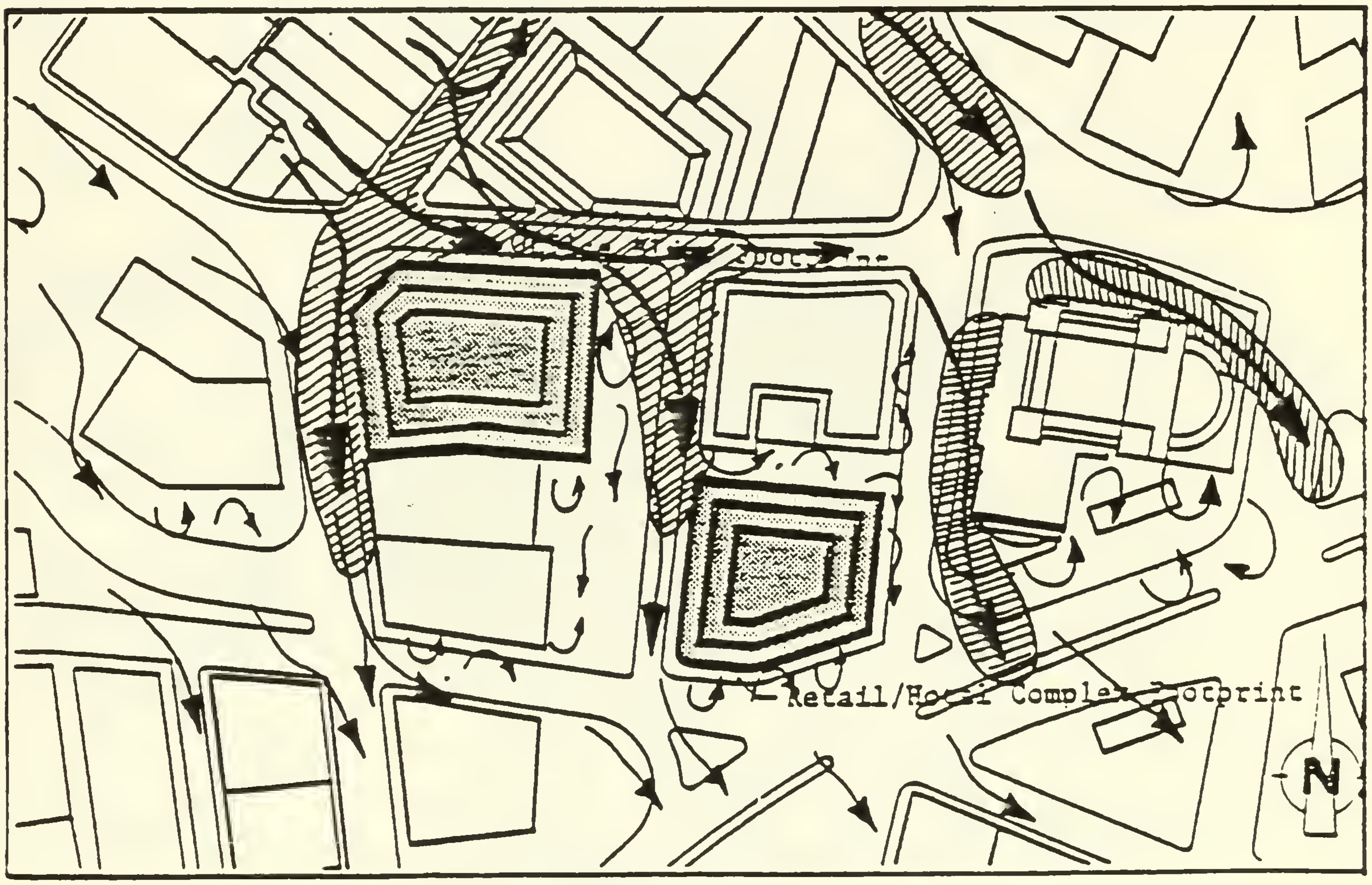
ALTERNATIVE 6

ACCELERATED FLOW REGION

Figure IV G-23:
Anticipated Wind Flow Patterns - Wind from the West



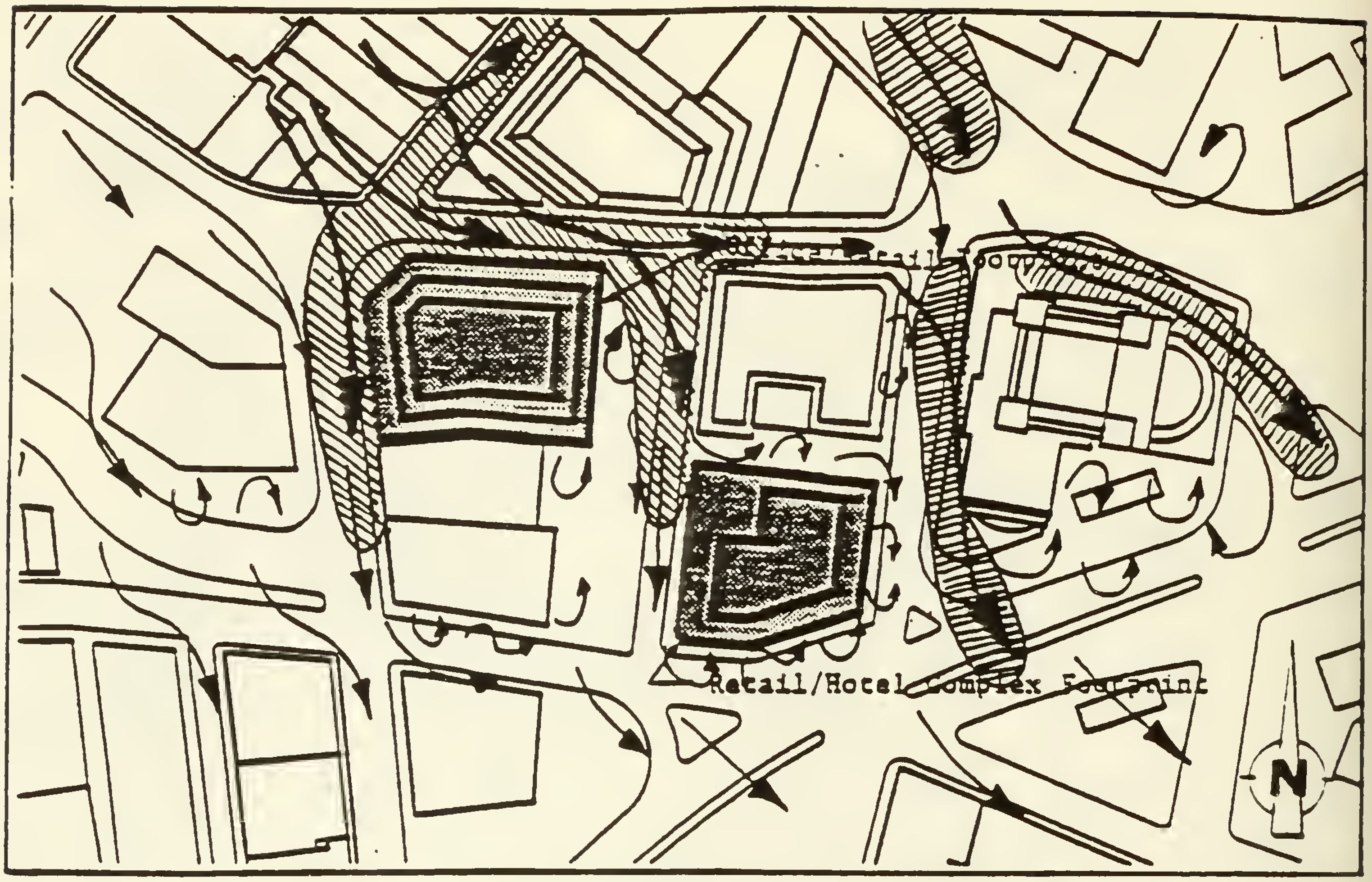
ALTERNATIVE 1



ALTERNATIVE 2

ACCELERATED FLOW REGION

Figure IV G-24:
Anticipated Wind Flow Patterns - Wind from the Northwest



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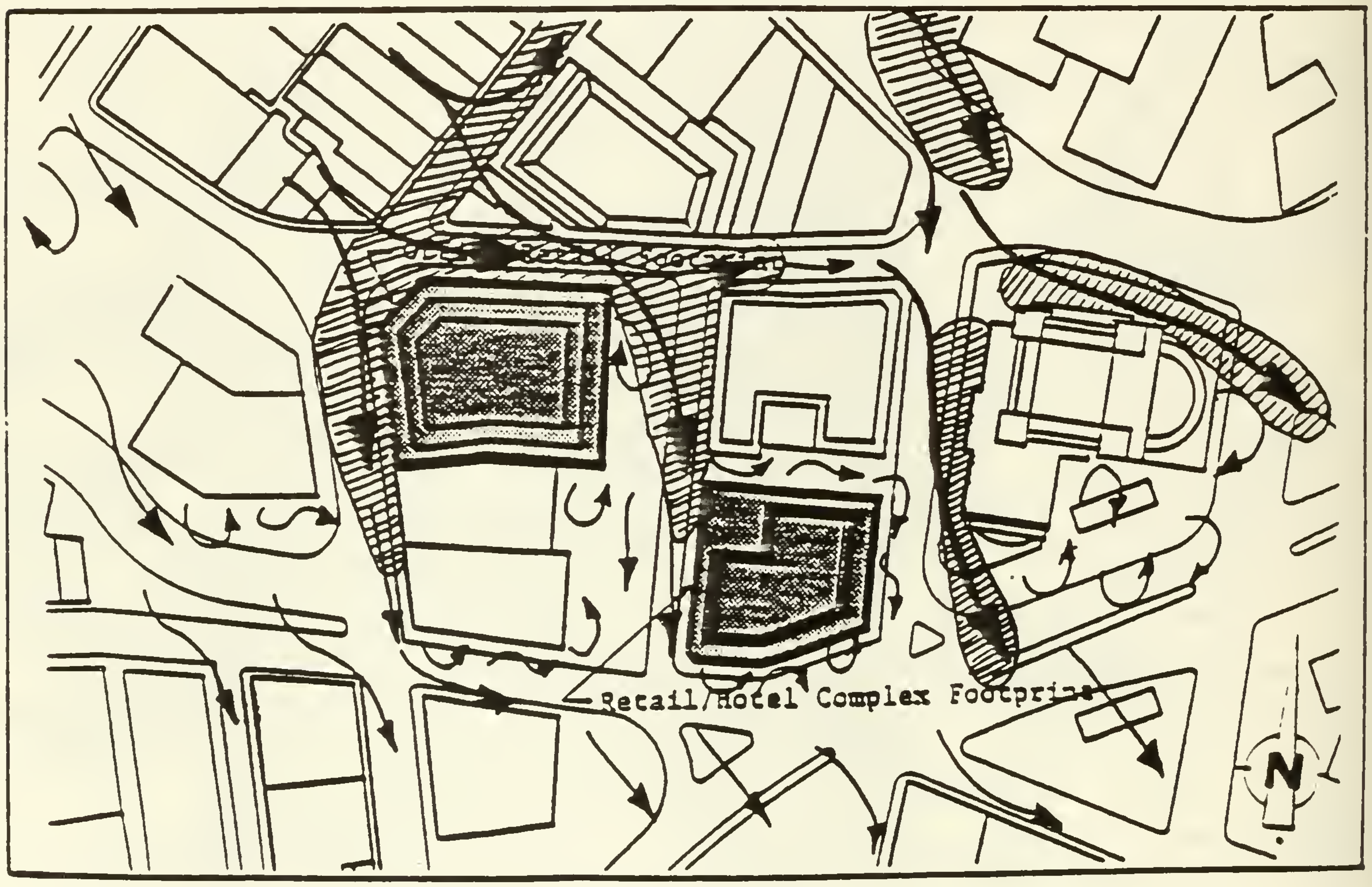
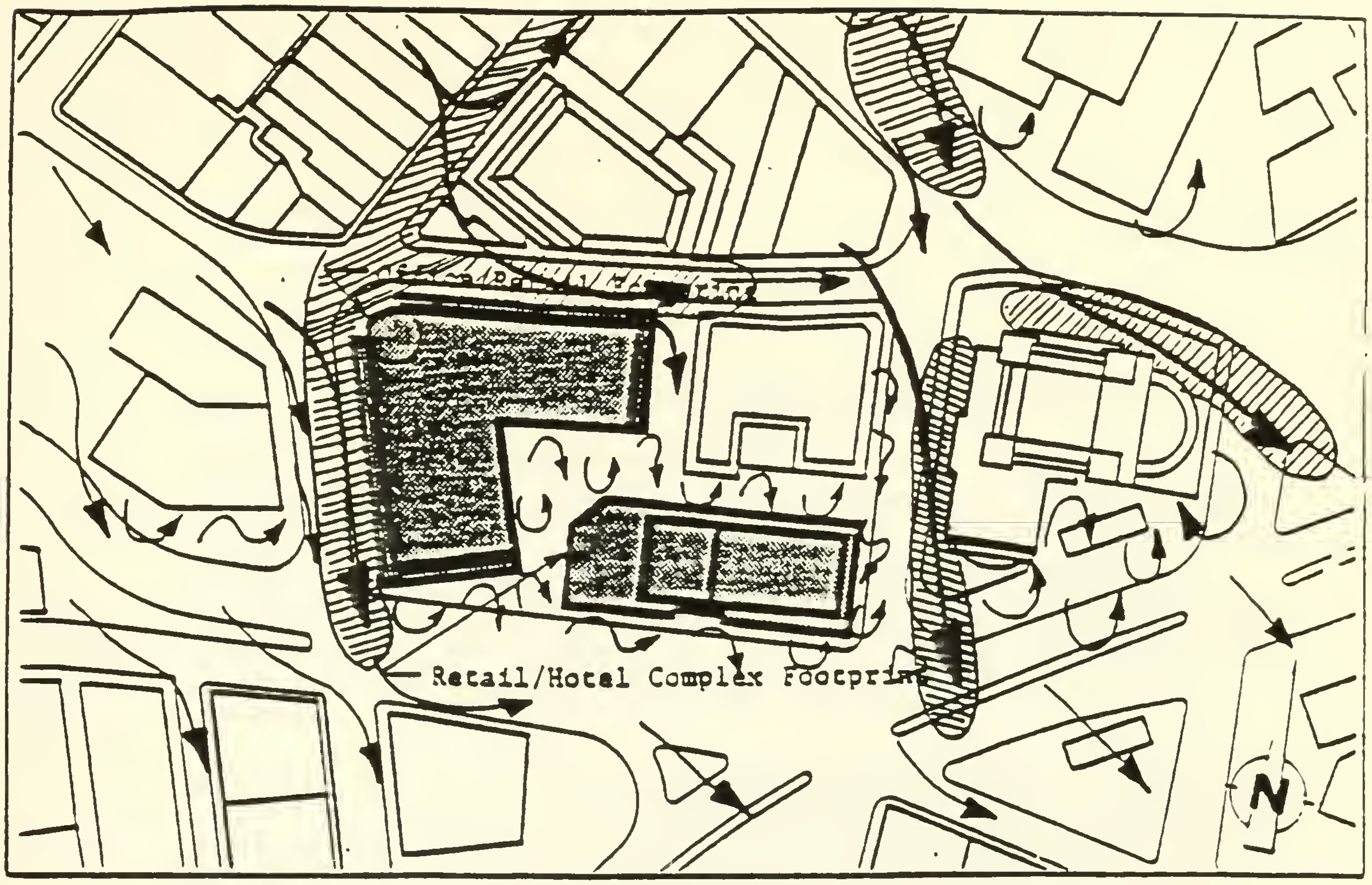


ALTERNATIVE 4

ACCELERATED FLOW REGION

Figure IV G-25:
Anticipated Wind Flow Patterns - Wind from the Northwest



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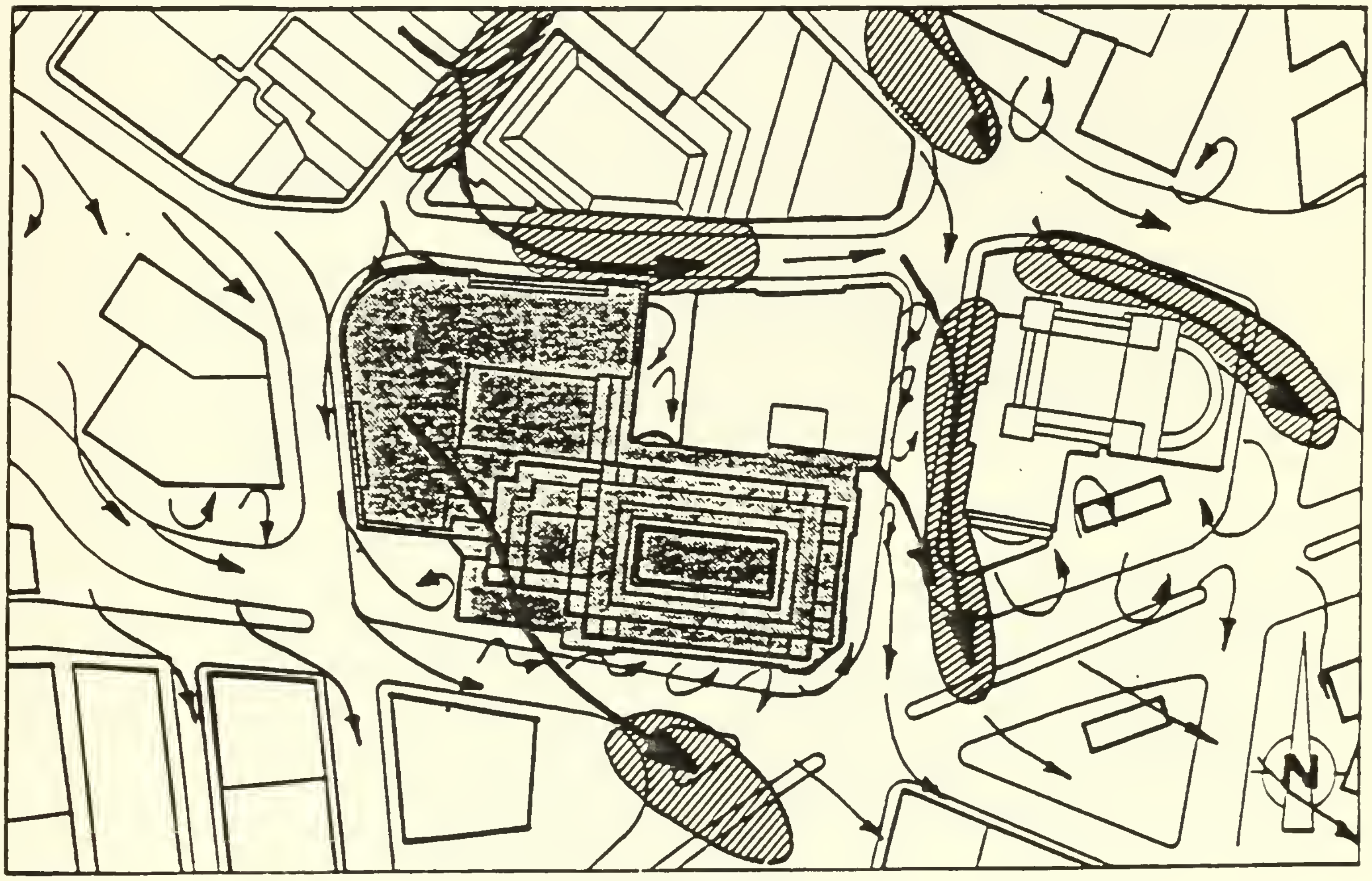


ALTERNATIVE 6

ACCELERATED FLOW REGION

Figure IV G-26:
Anticipated Wind Flow Patterns - Wind from the Northwest

H. HISTORIC AND ARCHAEOLOGICAL RESOURCES

Description of the Environment

The project site is located on the Shawmut Peninsula, which was part of Boston's original land mass, and near the Colonial waterfront. Once a fashionable residential area, this section of Boston was converted after 1830 to warehousing in response to the prosperous "carrying trade" which transferred goods from the waterfront to the new railroad facilities in the South Cove area. Substantial granite structures were built to house these operations. Later, dry goods and wool wholesalers operated here.

As the principal trading city for the mills of New England following the Civil War, Boston's dry goods district was the most active in the northeastern United States, retaining its prominence in this regard through the early twentieth century. Dry goods dealers were centered around Chauncy, Summer, Otis, and Devonshire Streets, while shoe and leather wholesalers and related dealers and manufacturers gravitated toward the Church Green area.

In November 1872, the entire district was destroyed by a disastrous fire which started on Summer Street and destroyed 776 buildings in a 65-acre area. Most of the buildings now standing in the district were built in an heroic effort; the burned district was rapidly rebuilt with buildings of similar mass and scale, but with new fireproof techniques. These structures, dubbed "the new palaces of Boston merchants" by contemporary newspaper accounts, departed from the earlier, more somber granite-style buildings by adopting a variety of Victorian motifs.

The street pattern of the district is in itself significant, its winding nature dating back to the Colonial period. The most notable feature is the well-known "Tontine Crescent" - a bowed area of Franklin Street once flanked by row houses designed by Charles Bulfinch, which still retains its characteristic shape. The intersection of Summer and Bedford Streets has been known as "Church Green" since the seventeenth century. Bulfinch's octagonal New South Church, built in 1814, commanded this location during the Federal Period.

Historic Resources

The project site is located in an area of downtown Boston that has a substantial number of historic buildings and districts. To the north of and adjacent to the site is the Commercial Palace District. To the south of the site is the Kingston-Essex Street Textile District. To the southeast is the Leather District. All of these districts and some of the buildings within them are included in or are eligible for inclusion in the National Register of Historic Places. This determination has been made based on findings of the Boston Landmarks Commission and the Massachusetts Historical Commission. The historic buildings and districts described in this section are located on Figure IV H-1.

Information pertaining to these buildings and districts has been obtained from the 125 Summer Street Environmental Impact Assessment, the Boston Landmark Commission's Commercial Palace Report, and Historic Inventory Forms of the Boston Landmarks Commission. Below are identified those districts and structures which have the greatest relationship to the project site.

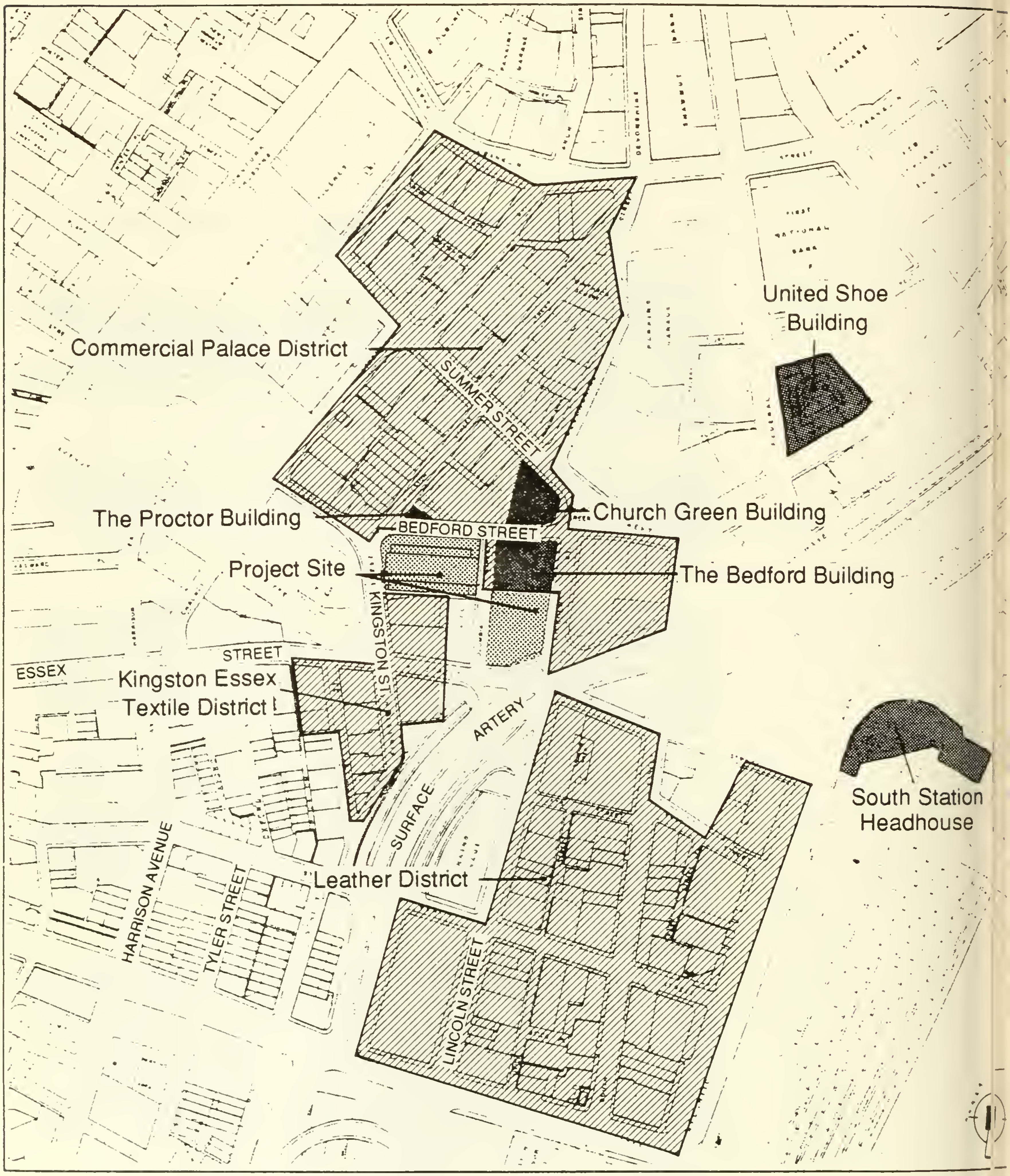


Figure IV H-1:
Historic Resources

Commercial Palace District

The Commercial Palace District has been determined by the Secretary of the Interior to be an area eligible for inclusion in the National Register for Historic Places. This area, bounded by Chauncy, Hawley, Devonshire, and Bedford Streets, was rebuilt quickly after the Great Fire of 1872 to serve Boston's dry goods and clothing industries of the late 19th and early 20th centuries. According to the Boston Landmarks Commission report, this district is characterized by five- to six-story masonry row buildings with mansard roofs, consistent cornice height, and facades of sandstone, marble, or granite. The structures possess detailed characteristics of the Italian Renaissance, Ruskinian Gothic, Panel Brick, and Neo Grec styles. The winding nature of street patterns and the presence of approximately 26 historic buildings further enhances the area. The involvement of prominent 19th Century architectural firms (Emerson and Fehmer, N.J. Bradlee, Cummings and Sears, Charles F. Kirby, G.J.F. Bryant and Rogers, and Winslow and Wetherell) in the design of the buildings in the district has added to its historic significance. Following is a brief description of the most notable buildings in the district near the project site.

The Church Green Building (101-113 Summer Street), located at the intersection of Summer, Bedford, and Lincoln Streets, is a Boston City landmark and is listed in the Massachusetts Register of Historic Places. Constructed immediately following the Great Fire of 1872, the building contains two five-story structures on a trapezoidal lot and was used as commercial space for shoe and leather or dry goods trades, historically significant industries of New England in the 19th century. The building's Second Empire style, designed by prominent architects Carl Fehmer and N.J. Bradlee, is one of the most impressive masonry "Commercial Palaces" existing from the reconstruction period, with its granite facade, polygon plan, and strategic location as one enters the city from the Expressway or South Station. The Church Green Building recently has been restored in connection with the development of 99 Summer Street. The structure is directly visible from the project site.

The Bedford Building located at 89 - 103 Bedford Street immediately abutting the project site to the north and east, the Bedford Building is listed individually in the National and Massachusetts Registers. Designed by the firm of Cummings and Sears and built in 1874 using innovative fire-resistant construction methods, the building is unique in its articulation of dressed elevations, each carefully expressed with different combinations of granite, marble, and brick, and various degrees of ornamentation. This the five-story commercial building is located at the intersection of Boston's financial and shopping districts, near Church Green and Dewey Square. The historic significance of this building lies in the integrity of design, setting, materials, workmanship, and location. Recently renovated, the Bedford Building is today used for office space.

The Proctor Building (100 - 106 Bedford Street), located at the corner of Bedford and Kingston Streets in the Church Green block, is across Bedford Street to the north of the Kingston-Bedford parking garage. The building is a Boston City Landmark and is listed in the Massachusetts Register. The early history of the Proctor Building is associated with the shoe and leather industry, one of the prominent trades in Boston and Massachusetts in the mid-19th century. In addition to such historic associations, the building is architecturally significant as the most elegant and extensive example of the use of terracotta on a small commercial building in downtown Boston. Designed by the firm Winslow and Weatherell

and built in 1897, the building is an elaborately decorated example of Spanish Renaissance Revival style architecture.

The Leather District

The Leather District, bounded by Atlantic Avenue, the Surface Artery, Kneeland Street, and Essex Street, is listed in both the National and Massachusetts Registers. Recognized as Boston's most intact and homogeneous district of the late 19th century, the area is significant for its association with shoe manufacturing and leather wholesaling industries.

The buildings in this district are characterized by 5- to 6-story red brick warehouses and wholesale houses. The predominant style is Richardsonian Romanesque with its multi-level arcades and rock-faced brownstone trim. The core of the district is remarkable for its quality, particularly its cast iron storefronts and its harmony of design, scale, and materials.

The Leather District, located to the southeast of the project site, is separated from the project site and the rest of the city's commercial district by the Southeast Expressway, railroad sidings, and undeveloped land with highway ramps. The major buildings in the district were designed in the years 1883 - 1884 and are located along South Street.

The Kingston-Essex Street Textile District

This district, located at the intersection of Essex and Kingston Streets adjacent to the project site, consists of seven late-19th century manufacturing and wholesale houses, and appears to be eligible for listing in the National Register. Its significance is tied to the city's textile trade and growth as a major manufacturing center. The structures represent Boston's textile and woolens center and are still used for textile storage and related functions. The Neo-Classical Revival and Second Renaissance Revival design styles of these buildings are attributed to a number of noted 19th Century architects including Kendall, Taylor, and Stevens; Winslow and Wetherall; William R. Emerson; and Theodore Minot Clark.

Two buildings in the district (80 and 88 Kingston Street) that are on the south side of the Kingston-Bedford block and adjacent to the project site have been determined to be not eligible for National Register listing as individual buildings (U.S. Department of the Interior, November 6, 1979). These buildings are distinguished from the Victorian era blocks in the Summer and Bedford Street areas due to a change in scale and materials. However, the Boston Landmarks Commission has surveyed these buildings and has classified them as contributing structures (category 4) to the historic district, thus meriting National Register listing as part of the district.

Both buildings are five story structures built with brick and stone materials. According to the Boston Landmarks Commission, they are architecturally significant as structures designed by popular and prominent Boston architectural firms and as elements of a small group of intact late 19th century brick loft buildings, representative of structures which once comprised Boston's textile center.

South Station Headhouse. Built in 1896 - 1899 and designed by architects Shepley, Rukan, and Collidge, Boston's South Station is historically significant for its Classical Revival style design. This building is listed on the National Register for its association with the development of passenger train lines and several innovations in the evolution of railroad station planning. The building, located at the corner of Atlantic Avenue and Summer Streets, approximately 400 feet southeast of the project site, is separated from the project site by a high-rise office building (One Financial Center) and the Southeast Expressway.

United Shoe Machinery Building. The United Shoe Machinery Building is a Boston City Landmark and is listed on the National and Massachusetts Registers. Built in 1929, the structure was one of Boston's largest skyscrapers and was designed by Parker, Thomas, and Rice. The building is significant for its Art Deco design and architectural detail as well as for its relationship with the shoe industry of Massachusetts. The building is located approximately 300 feet to the northwest of the project site at 140 Federal Street.

Archaeological Resources

The project parcels are located near the waterfront edge of the historic Shawmut Peninsula, which was the original land surface of Colonial Boston. Figure IV H-2 shows the approximate location of the project site in relation to the original shoreline of Boston. As part of Boston's original land mass, it is possible that significant subsurface archaeological resources that relate to prehistoric Indian occupation and/or the earliest European settlement of Boston could be located on the site. Although these subsurface resources probably have been disturbed by the 250 years of development that has occurred on the site, no subsurface archaeological records exist as documentation of the characteristics of the site.

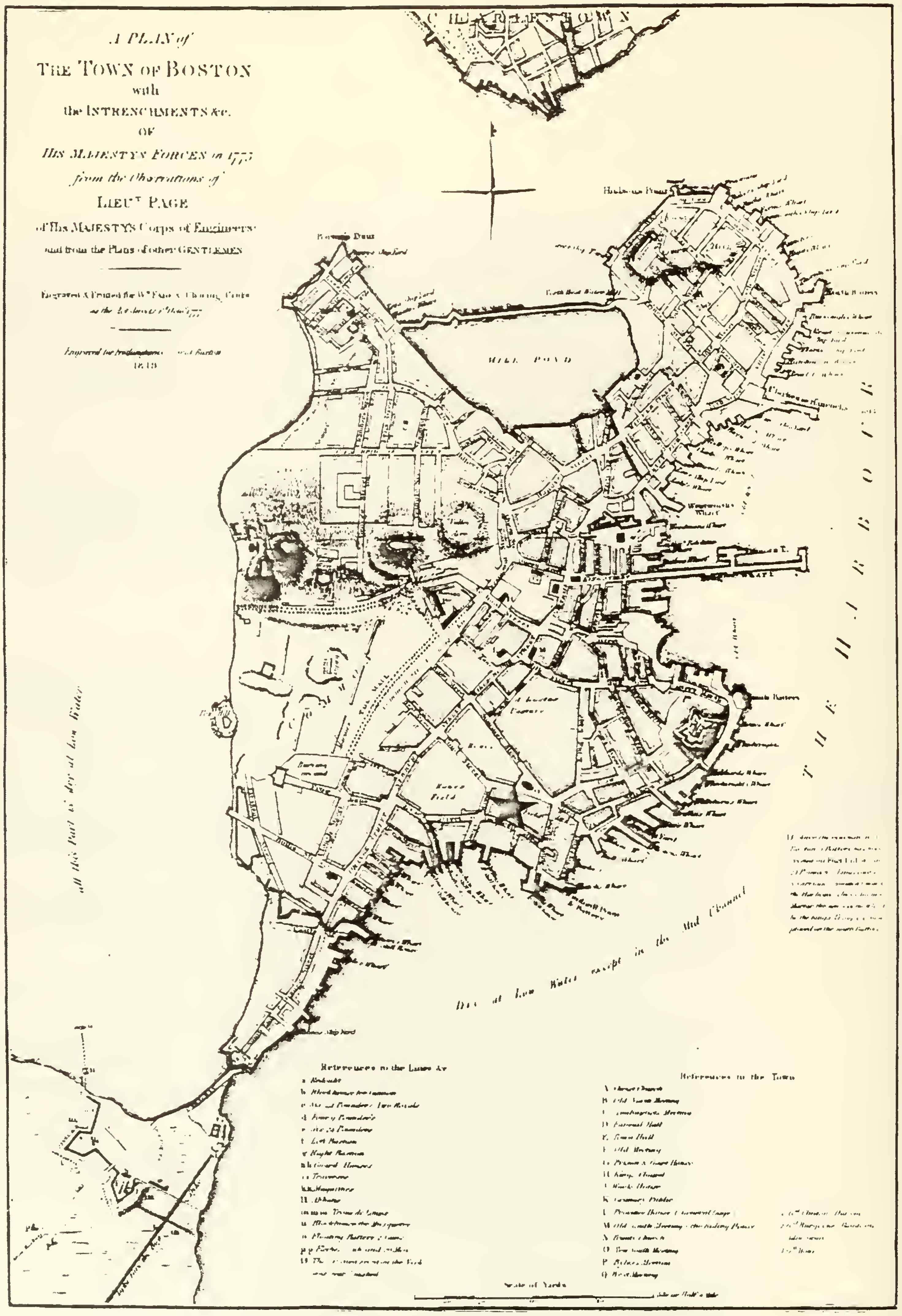
The project site is now located in the built-up urban area of downtown Boston. From the book "Boston, A Topographical History" (Whitehill, 1963), the following recent archaeological history of the site has been obtained:

In 1722, the project parcels comprised a portion of the land bounded by Essex Street to the south, Short Street (now part of Kingston Street) to the west, Pond Street (now Bedford Street) to the north, and South Street to the east. Just south of Essex Street was the shoreline of South Cove, dominated by Hill Wharf and Wind Mill Point. The Bonner map of 1722 indicates approximately five structures built on the project site. By 1814, the project parcels were better contained by Essex, Short, and Pond Streets to the south, west, and north, as well as by Columbia Court bisecting the site. The waterfront south of Essex Street was in much the same location, but many more piers and wharves were present. The J.G. Hales map of 1814 indicates twelve structures on the project parcels. The Great Fire of 1872 obliterated those structures standing at the time.

Comparison and Probable Impacts of the Alternatives

Historic Resources

The five build alternatives consist of buildings that range in height from 240 feet to 514 feet. Alternatives 2 through 4 have bases that are similar in height, mass, and footprint, while the base for Alternative 5 is different in height and site coverage. Except for Alternatives 5 and 6, which require the demolition of the buildings at 80-86 and 88-100 Kingston Street, none of the alternatives entails destruction or al-



Source : Vanderwarker, Boston Then and Now, 1982.

★ Approximate Site Location

Figure IV H-2:
Historical Map Boston 1775

teration of any properties either listed in the National or Massachusetts Registers of Historic Places or potentially eligible for listing. Nevertheless, any development on this site must be careful to minimize isolation from, or alteration of, the environment surrounding the historic resources and the introduction of elements that are out of character with the designated historic structures and districts.

Any of the build options will have an effect on the surrounding environment and historic resources. However, as long as detailed design of the selected alternative incorporates elements to mitigate those impacts, then any of the build options may have more beneficial impacts on these resources than the No Build Alternative, which includes the continuation of the existing garage and parking lot and thus detracts from the historic character of the environs.

Although the Kingston-Bedford-Essex Street project site is not located within any designated historic district, the Commercial Palace District and Kingston-Essex Street Textile District are immediately adjacent to the site and thus are the historic districts most closely associated with the project site. The Leather District, because it is separated from the site by the Surface Artery and Expressway, probably would not be affected by the proposed project.

Although there are no structures on the project site which are Boston City Landmarks and/or are individually eligible for listing or listed in the National or Massachusetts Registers of Historic Places, there are five historic structures which could be affected by the proposed development:

° The Church Green Building (101 - 113 Summer Street), which can be seen from the site and contributes to the historic character of Bedford Street;

° The Bedford Building (89 and 103 Bedford Street), which faces the east side of the Kingston-Bedford block and the north side of the Essex Street parking lot site, and contributes significantly to the historic character of Bedford Street;

° The Proctor Building (100 - 106 Bedford Street), which faces the north side of the Kingston-Bedford block and further enhances the historic character of Bedford Street;

° 80 - 86 Kingston Street and 88 - 100 Kingston Street, which are located on the southwest corner of the Kingston-Bedford block. In Alternatives 2 through 4, these two structures would face the south side of the Kingston-Bedford building and the west side of the Essex Street building. For Alternatives 5 and 6, it would be necessary for these two buildings to be demolished. These buildings have been surveyed by the Boston Landmarks Commission and have been classified as contributing structures within the Kingston-Essex Street Textile District. The District itself appears to meet the criteria for listing in the National and Massachusetts Registers. Alternatives 5 and 6, therefore, would have an adverse effect on these two structures and the District.

Of all the alternatives, Alternative 5 yields a massing and height most consistent with the historic structures in the area. Alternative 6, however, even though it proposes the tallest structure (514 feet), provides a good opportunity to relate closely to the adjacent and nearby historic structures. Alternative 6 provides cornice lines at the top of the streetwall of no more than 75 feet, which is consistent with the height of buildings in the vicinity of the project site. This alternative re-

lates most closely to the Bedford Building and, through placement of the tower along the southeastern corner of the site, relates most closely to the heights of 125 Summer Street and One Financial Center beyond. Alternatives 2 and 3, and to a lesser extent Alternative 4, all have tall elements which are out of scale with the predominantly 5- and 6-story commercial buildings of the Kingston-Essex Street Textile and Commercial Palace districts. However, it should be noted that this historic scale already has been interrupted by recent buildings in the area, such as 99 Summer Street and 125 Summer Street.

For the most part, the proposed project would add few new shadows on the neighboring historic properties. Based on the shadow study drawings included in Section IV E, Alternatives 2 through 5 would add new shadows on Kingston Street during midday in the spring and fall, at the corner of Kingston and Bedford Streets at midday during the summer months, and on the Church Green Building in the summer afternoons. Alternatives 5 and 6 would shade the Kingston-Bedford Streets corner during summer mornings; and both Alternatives 2 and 5, which propose the tallest structures of all the development options, would extend shadows to the Boston Common in the early morning hours in the winter.

In summary, the direct impacts of the project would be limited to the effects it has on the nearby historic structures and districts. Provided the development, and particularly the base of the buildings to the cornice line, respects the urban design characteristics and architecture of the adjacent historic districts in its use of materials, scale, and building design, all of the build alternatives may have a more beneficial effect on the historic resources of the area than the No Build Alternative.

Archaeological Resources

Located on the waterfront edge of the historic Shawmut Peninsula, which was the original land mass of Colonial Boston, the project site may contain significant subsurface archaeological resources relating to prehistoric Indian occupation and/or the earliest European settlement of the area. As a result, any development of this site could affect archaeological resources. In particular, since all the build options would entail substantial excavation for subsurface parking, archaeological resources could be significantly affected. To ensure that any potential archaeological resources are not unnecessarily disturbed or destroyed in the development process, an archaeological reconnaissance survey will be conducted and the findings will be reported in the Final Environmental Impact Report (FEIR).

The purpose of the reconnaissance survey, which also was recommended by the MEPA Scoping Certificate of August 8, 1986, will be to locate and identify any historic or prehistoric remains in the project site which could be adversely affected by construction activities. This archaeological investigation will be conducted in accordance with the requirements of the Massachusetts State Archaeologist, as well as the City Archaeologist, and should include the following steps:

(1) Select a qualified archaeologist or archaeological research organization to conduct the survey.

(2) Undertake a walkover inspection of the site and conduct general background and documentary research, including a review of municipal and other records, files of the State and City Archaeologists and the State Historic Preservation Officer, historic registers, maps, and atlases, and records of local historic preservation organizations. Existing boring logs also should be inspected and analyzed. The information obtained from this survey would allow the targeting of specific locations within the project area for more intensive investigation.

(3) Conduct a systematic subsurface sampling of the project site. A plan for subsurface testing, using appropriate techniques (test pits, soil borings, etc.) to determine the presence of any archaeological resources in the site, should be coordinated with the City and State Archaeologists.

(4) Report the findings to the City and State Archaeologists.

(5) If significant resources are identified or discovered, describe a strategy proposed to mitigate the development's impact on archaeological resources.

Mitigation Measures

Historic Resources

Detailed project design of the selected development alternative should incorporate appropriate features of the nearby historic structures and the adjacent Commercial Palace and Kingston-Essex Street Textile districts in the choice of building height, materials, fenestration and facade, setbacks, and mass. The predominant height in the district is seven stories. Brick and stone (especially granite) are the dominant materials. Facades have the following characteristics:

° vertical, rectilinear windows, with double-hung sash, arranged in a regular pattern, and aligned vertically;

° dramatic expression of horizontals integrated with vertical articulations;

° highly articulated architectural details which create intense shadow-play on the facades; and

° projecting cornices, often with pediments, which create an interesting skyline.

Buildings in the district, with few exceptions, are not set back from the street and facades are placed directly on the property line. The massing and heights of the build alternatives would be significantly greater than those of the historic resources in the area. However, in those instances where new buildings with greater square footage are introduced into historic districts, the new buildings can be designed so that they appear to match the massing of buildings in the district on the ground level. This is accomplished by matching the height of the lower facade of the base of a new building with the height of nearby historic buildings. The higher elements of the building can be set back sufficiently so that they are visually disengaged from the building base and can be easily distinguished from it.

If the base of the structure is similar in height to the nearby historic structures and has similar setbacks, similar facades, and compatible materials and design characteristics, potential adverse effects of the construction on the historic surroundings can be mitigated.

Finally, the 1983 Commercial Palace District report of the Boston Landmarks Commission and the Boston Redevelopment Authority suggests the following guidelines for any development of the Kingston-Bedford Street garage area:

- restrict the cornice height of any new building to six floors along Bedford Street and that portion of Lincoln Street alongside the Bedford Building, although a higher building set back of 25 feet would be acceptable.
- the full width of Lincoln Street should be maintained as open space even if the street is discontinued, in order to preserve the setting for the Bedford Building.
- alignment along the street edge is desirable along Bedford and Kingston Streets, although not essential.

In both areas, it is critical that the material of the new construction blend with the predominant masonry materials traditional to the area. This will require careful coloring and scaling of materials to prevent abrasive contrast such as that exhibited by the tower at 100 Summer Street.

Archaeological Resources

After a development plan has been selected and a reconnaissance survey completed, a determination should be made with respect to the level of additional archaeological investigation required. If additional, more detailed study is necessary, the work should include subsurface testing, the examination and evaluation of any archaeological resources uncovered for their significance, and the identification of any additional mitigation. Additional mitigation could include the recovery and documentation of identified resources to fully mitigate potential impacts.

In addition, due to the extensive construction excavation required of any of the build alternatives, further mitigation may warrant the presence of the City Archaeologist on-site during site preparation and foundation excavation. The City Archaeologist could identify currently unknown archaeological remnants and delay further construction to allow a determination to be made if the findings were significant enough to record.

I. OPEN SPACE AND RECREATIONAL FACILITIES

This section evaluates the open space and recreational resources which may be affected by the proposed development of the Kingston-Bedford-Essex Street site. In addition to summarizing the proposed new open space amenities to be provided, a summary of the existing open spaces available to the adjacent Chinatown community and the needs of that community is included. The section concludes with projected impacts and potential mitigation measures.

Existing Open Space and Recreational Resources

Open space and recreational resources currently within the vicinity of the project site include public parks, indoor recreational facilities, and pedestrian corridors. Open space and recreational resources are shown in Figure IV I-1 and are described below.

The project site is currently used for parking and has very little public open space. The existing public open space resources on the site are limited to the sidewalks along the streets which border the site. Further, these pedestrian areas are not well defined or controlled and the potential exists for pedestrian conflicts with cars circulating through the site or entering/exiting parking facilities.

Parks and Open Space

Parks and open space resources in the vicinity of the site include the Boston Common, Pagoda Park, Chinese Gateway Park, Eliot Norton Park, South Cove Park, Oxford Street pocket park, Oak and Tyler Street sitting area, Liberty Tree Plaza, Acorn Day Care tot-lot, Museum Wharf, Angell Memorial Park at Post Office Square, and Rowes and Foster's Wharf. The Boston Common is located approximately l,500 feet west and northwest of the site. It is one of Boston's largest and most popular parks with a total area of 65 acres. Pedestrian access to the Boston Common from the Kingston-Bedford-Essex Street site is in a northwesterly direction via Summer Street and through the Downtown Crossing area , or via Avenue de Lafayette through Temple Street or West Street. Either route can be traveled on foot within a matter of minutes. The Boston Common is equipped with tennis courts, ballfields, a tot lot, and a wading pond.

The Chinese Gateway Park at Beach Street and Hudson Street includes a gateway structure given as a bicentennial gift to the Chinese community by the government of Taiwan and a seating area. This area serves as an entry to Chinatown, as well as a backdrop for special events. This park is located approximately 550 feet south of the Kingston-Bedford-Essex Street site.

Eliot Norton Park is a passive recreation area located near the intersection of Tremont Street and Broadway at the southwestern edge of the South Cove area. This park is over 2,000 feet to the southwest from the Kingston-Bedford-Essex Street site. Although it is conveniently located for the Chinatown community, Eliot Norton Park has substantial security problems and is not heavily used by residents.

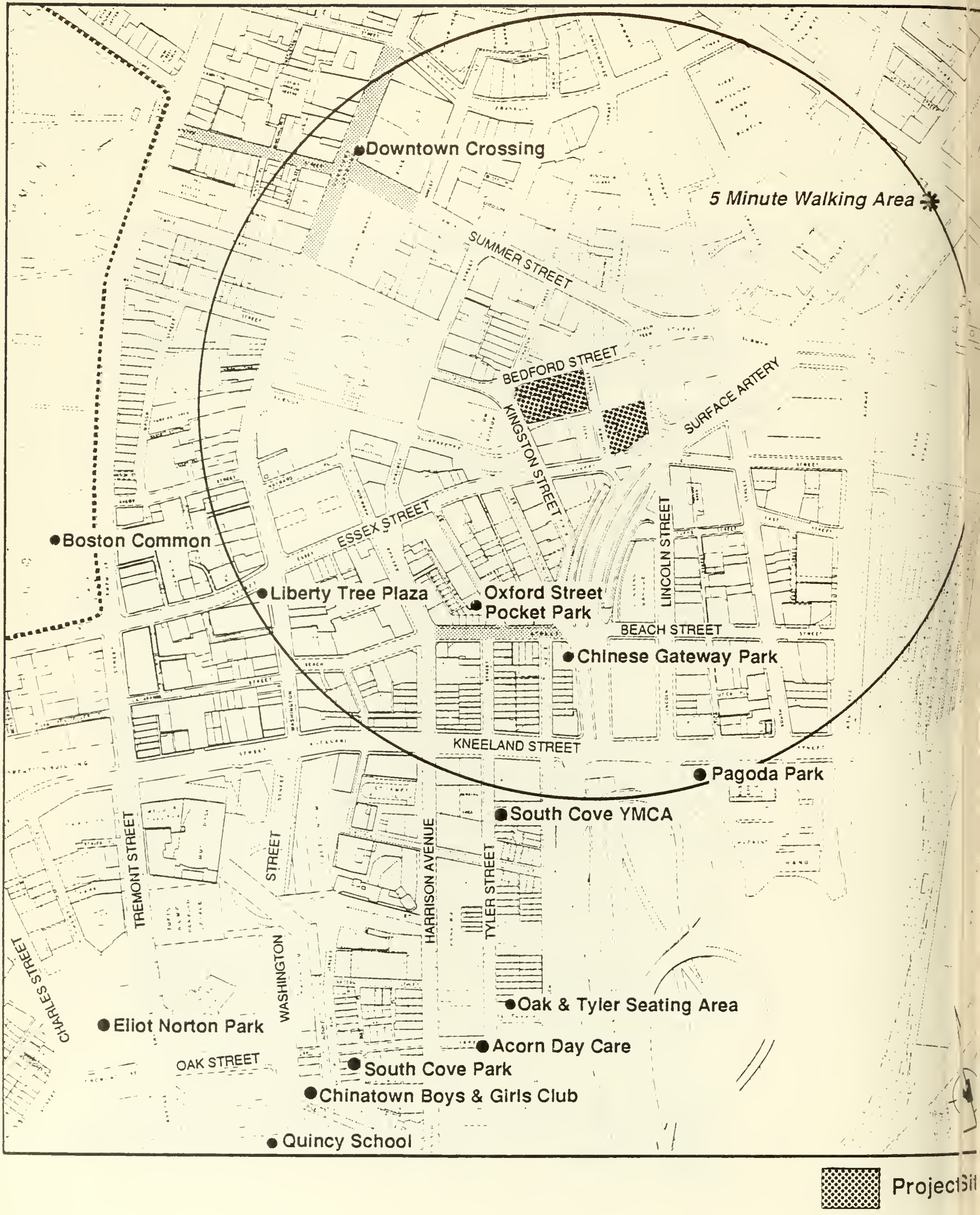


Figure IV I-1:
Open Space and Recreational Resources

Pagoda Park is located approximately 1,000 feet to the south of the project site at the intersection of Kneeland Street and Lincoln Street on the southern edge of Boston's Leather District. It is equipped with basketball and volleyball courts and some seating. South Cove Park is located on Oak Street, approximately 2,000 feet south of the project site. Facilities include basketball courts, limited seating, and a play area for children. This area is heavily used by residents of Chinatown.

The Oxford Street vest-pocket park and the sitting area at the intersection of Oak Street and Tyler Street provide small areas for sitting and gathering. With the significant levels of pedestrian traffic in Chinatown, these areas are well-used throughout the week and on weekends. The Liberty Tree Plaza, located at the intersection of Essex Street and Washington Street, also provides for outdoor seating in a landscaped setting. However, this area suffers from inadequate maintenance and security problems.

The Acorn Day Care tot-lot in the central court area at Tai-Tung Village is operated and maintained by Acorn Day Care but is shared with residents. The close proximity of major highways and busy streets reinforces the need to provide additional safe play areas for children.

The Fort Point Channel is located approximately 1,500 feet to the east of the project site and is accessed directly via Summer Street. The predominant open space feature is Museum Wharf, which provides places to sit and eating establishments. Post Office Square is approximately 1,500 feet to the north of the site. The Post Office Square Park, 1.5 acres in the center of the Financial District, is currently under construction, with completion scheduled in 1991. The park replaces an above-grade garage. Adjacent to the new park is Angell Memorial Park, a small, landscaped park with abundant seating. This park is well-used by office workers.

Rowes' and Foster's Wharf is approximately 2,000 feet to the north on Boston Harbor. This waterfront development includes open spaces, a marina, outdoor eating facilities, and a ferry terminal. There is also direct access to the entire Harborpark system at this site. Future extensions of Harborpark will connect the Wharf to the Fort Point Channel.

Indoor Recreation

Indoor recreational facilities are currently provided at the South Cove YMCA, the Quincy School, and the Chinatown Boys' and Girls' Club. The YMCA is located in a temporary inflatable bubble structure. Located on Tyler Street one block south of Kneeland Street, the YMCA provides court space for basketball and volleyball, locker facilities, and other support activities. Although limited in space and facilities, the YMCA offers the only access to indoor recreation in the evening and during the weekend.

The Quincy School, relocated from Tyler Street in 1975, has a gymnasium, swimming pool, and rooftop play area. This facility is located at the corner of Washington Street and Oak Street and is approximately 2,000 feet south of the Kingston-Bedford-Essex Street site. The gym and pool are heavily used facilities; the rooftop area is less intensively used to because of poor lighting, maintenance, and security problems.

The Chinatown Boys' and Girls' Club is operated out of a rented facility at the corner of Washington Street and Marginal Road. Pool tables and some gym equipment are available to members. Special arrangements are made with the nearby Don Bosco School for summer programs.

Pedestrian Corridors and Connections

There are several significant pedestrian ways in the vicinity of the Kingston-Bedford-Essex Street site that have been established to address the needs of shoppers, commuters, and residents. These include Dewey Square, Beach Street, Essex Street, and Downtown Crossing. Dewey Square is located one block to the east of the project site roughly at the intersection of Summer Street and the Surface Artery. Presently, much of the "Square" is devoted to a street system and provides a relatively poor pedestrian environment. Major improvements to the pedestrian system are under study by the City. These would provide for improved surface crossings for pedestrians from South Station to the downtown shopping and business areas.

Currently, the MBTA is constructing new entrances to the South Station subway station in connection with lengthening of the platforms. These entrances will provide improved access to the station and eliminate the need for many pedestrian trips across the heavily-travelled streets.

Beach Street is the principal retail area of Chinatown and attracts a large number of shoppers and visitors. The Gateway Park at the eastern end of the street marks the entry into the ethnic neighborhood. Beach Street and Harrison Avenue are a pick-up point for many workers employed by suburban restaurants. The Beach Street corridor doubles as a lively place for social gathering for workers before pick-up time and for regular visitors and shoppers from the nearby residential area. Beach Street is connected to the project site via Kingston Street and Edinboro Street.

Essex Street is the location of two of the most popular markets in Chinatown. Other markets are located nearby off Oxford Street and Harrison Avenue. The stores have expanded to include a bustling sidewalk market. In addition to retail stores, wholesale businesses also thrive in this business enclave located down Essex Street from the project site.

Downtown Crossing is located 1,000 feet northwest of the project site, and pedestrian access to it is via Summer Street. The Downtown Crossing is the center of Boston's downtown retail district. The retail activity in the Downtown Crossing area is anchored by Filene's, Jordan Marsh, and Woolworth's department stores. A majority of the retail establishments within this center are located within 1,000 feet of the intersection of Washington and Summer Streets, which were transformed into a pedestrian mall in 1978 when vehicular traffic was restricted from a twelve-block area.

Open Space and Recreational Problems and Needs

Chinatown/South Cove Community

The Chinatown/South Cove neighborhood, which extends to the southwest of the project site, is a fully urbanized area. Based on the 1980 Census data, Chinatown had a population density of 51.4 persons per acre, compared to a citywide average of 17.8 persons per acre. The open space and recreational resources within the community are not sufficient to serve the population adequately.

The high population density and lack of conveniently located open space have contributed to pedestrians using streets for walking and conversing. This has caused pedestrian/vehicular conflicts along some of the most heavily-used streets, including the commercial area along Beach Street. Thus, the need exists for additional off-street seating areas and well-defined pedestrian corridors.

The Kingston-Bedford-Essex Street site, while currently limited to parking as a land use, does function as a heavily-used pedestrian crossing area between Chinatown and the Financial District, and between the South Station area and Downtown Crossing. These pedestrian movement patterns have been and will be enhanced by various pedestrian improvements, including the 99 Summer Street pedestrian atrium and the 125 Summer Street through-building pedestrian connection. Thus, there is an open space need, inherent to the project site and reinforced by features of adjacent developments, to provide well-defined and safe pedestrian connections and public spaces on the site. These spaces should respond to the geometry of the established and planned pedestrian routes in the vicinity.

New Recreational Demand

The land uses proposed by the development alternatives for the Kingston-Bedford-Essex Street site will add new recreational and open space demand to the area. The overall open space and recreational needs of the development alternatives being considered can be defined by the user groups that each alternative will generate on the project site. A description of the likely user groups follows:

Office Workers

This population is generally on-site during working hours only. The major open space needs of the office workers include safe, convenient, and comfortable pedestrian access between the offices and their source of transportation and pleasant outdoor spaces free of disturbing noise and climatic extremes in which to spend the lunchtime period during warmer months.

Shoppers

Shoppers would be drawn to the Kingston-Bedford-Essex Street site for personal services and everyday shopping needs provided in the proposed retail areas. Their stay would be relatively brief, but the availability of adequate pedestrian spaces and pleasant surroundings near to the retail area could be influential in the level of retail activity and shopper comfort and convenience.

Commuters

A large number of pedestrians will be destined for the site each day. Easily maneuverable pedestrian corridors free of obstacles, through which large numbers of people can move during rush hours, is a requirement for the comfort and safety of commuters. Pedestrian and vehicular paths should be well defined and separated from vehicular conflicts.

Comparison and Probable Impacts of the Alternatives

Whereas the project site is currently used for public parking and provides very little public open space, all the proposed build alternatives would have a beneficial impact through the provision of improved public open spaces and interior, through-site pedestrian connections. However, the build alternatives do introduce additional office workers who would use the proposed and existing open space resources.

The No-Build Alternative (Alternative 1) would continue the existing parking uses. Site conditions would remain essentially unchanged. Under this alternative no recreational or open space resources would be provided. The current condition adversely affects the pedestrian environment because of the lack of well-defined pedestrian corridors across the site. In addition, the lack of on-site public open space areas for sitting and other passive uses would continue under this alternative.

The five build alternatives would provide a variety of different open spaces in the form of public plazas, pedestrian corridors, lobbies, arcades, and streetscape improvements. This section evaluates the proposed open space and recreational resources associated with each build alternative on the basis of their size and quality, their accommodation to pedestrians, and their relationship to off-site parks and open space resources.

Size and Quality

Alternatives 2 through 4 have identical public open space areas generated by identical ground level site and floor plans. For each of these three alternatives, two separate buildings are proposed, one on the Kingston-Bedford Street block and one on the Essex Street block. These buildings are separated by Columbia Street, which would remain open to limited vehicular traffic. Each alternative includes 5,600 square feet of open space. On the Kingston-Bedford Street block, a rectangular open space is planned to the east of the Kingston-Bedford Street building. This space could be programmed as a vest pocket park with seating and plantings.

The Essex Street block proposes a 30-foot wide rectangular open space area which runs from Lincoln Street to Columbia Street between the Bedford Street building and the proposed Essex Street building. This is intended as a pedestrian passageway connecting to 125 Summer Street.

Figures IV I-2 through IV I-4 indicate the location of the open space for Alternatives 2, 3, and 4.

PLAN VIEW

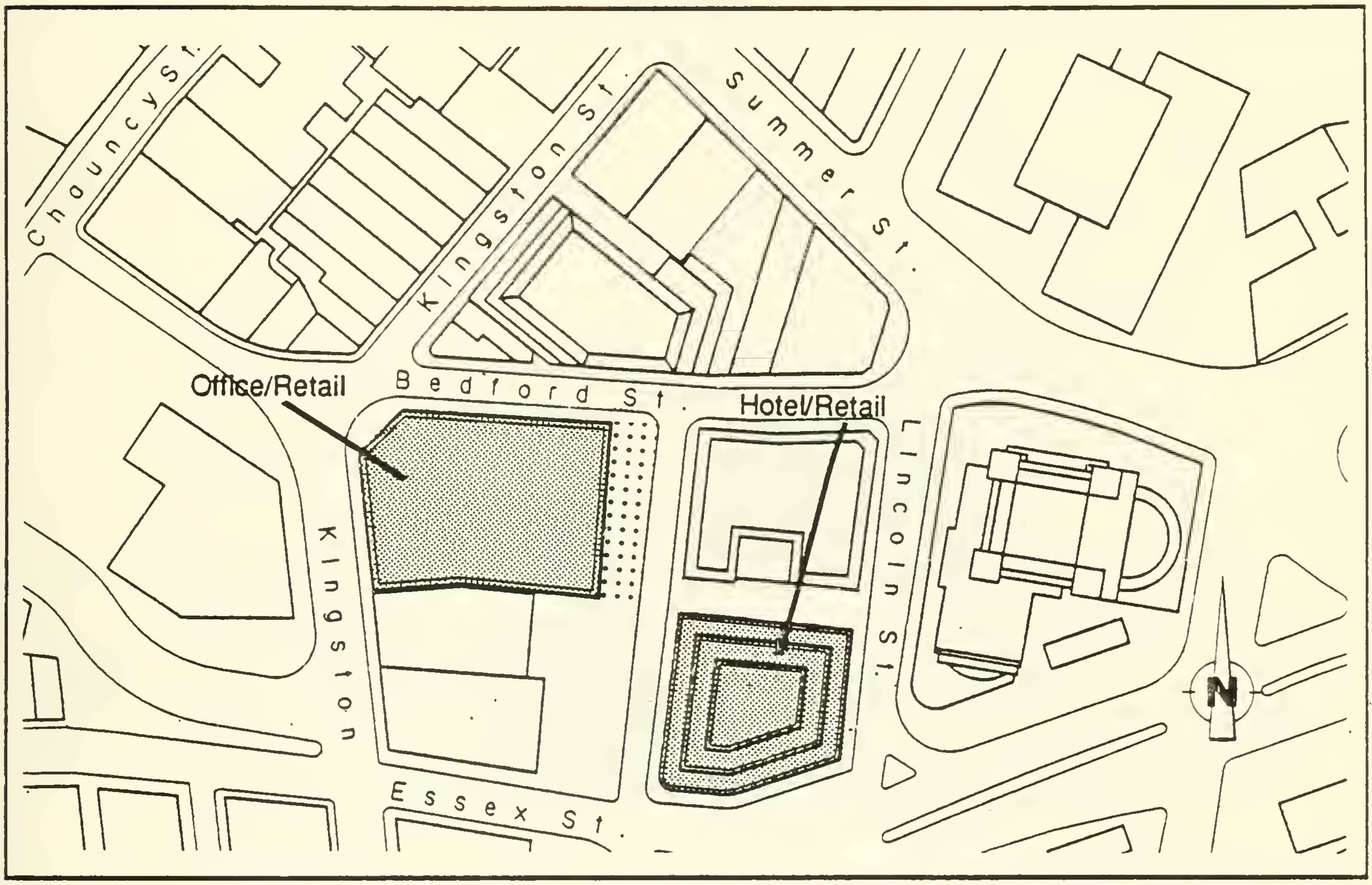


Figure IV I-2:
Open Space for 400 ft. Tower

PLAN VIEW

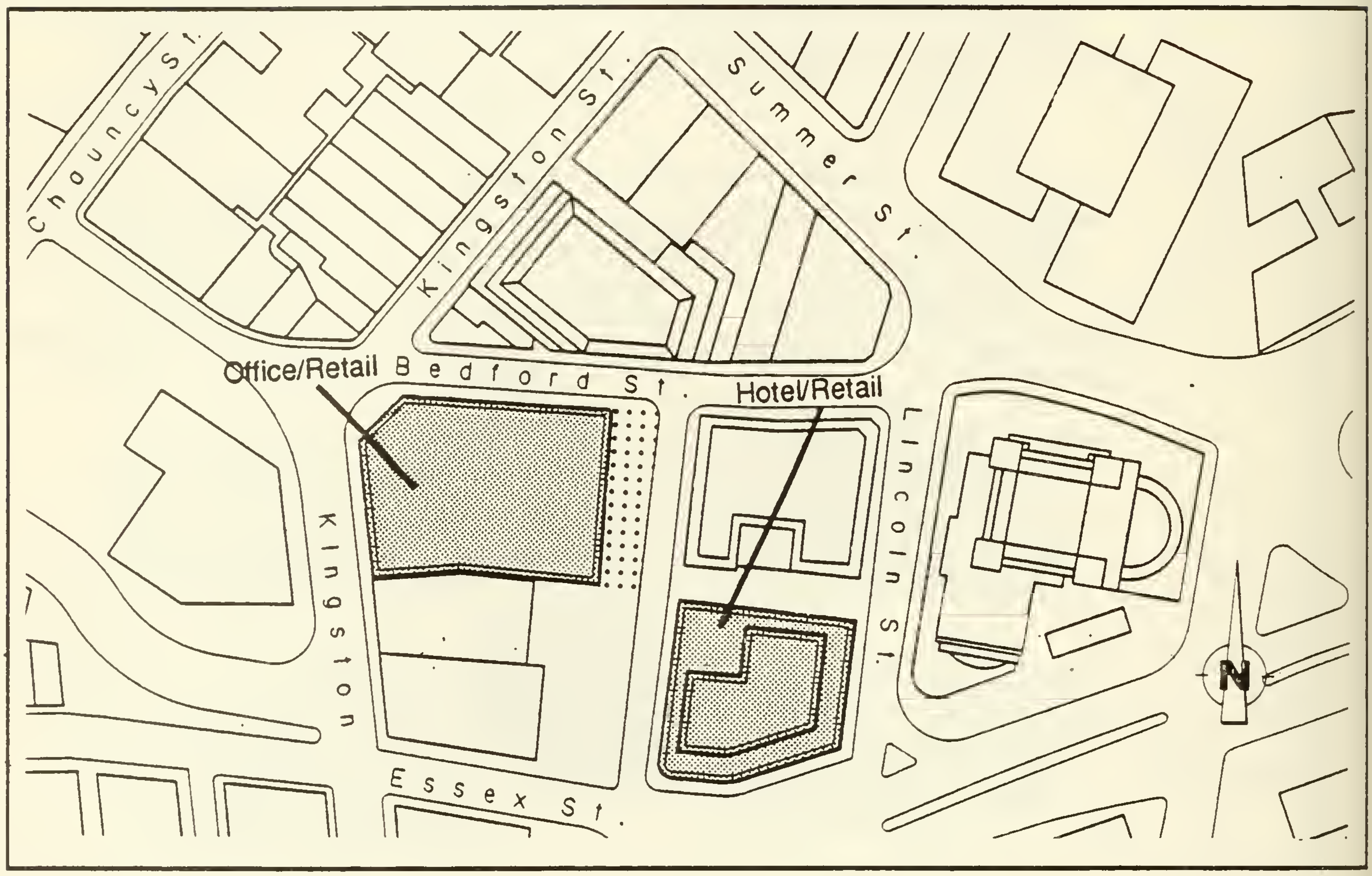


Figure IV I-3:
Open Space for 325 ft. Tower

PLAN VIEW

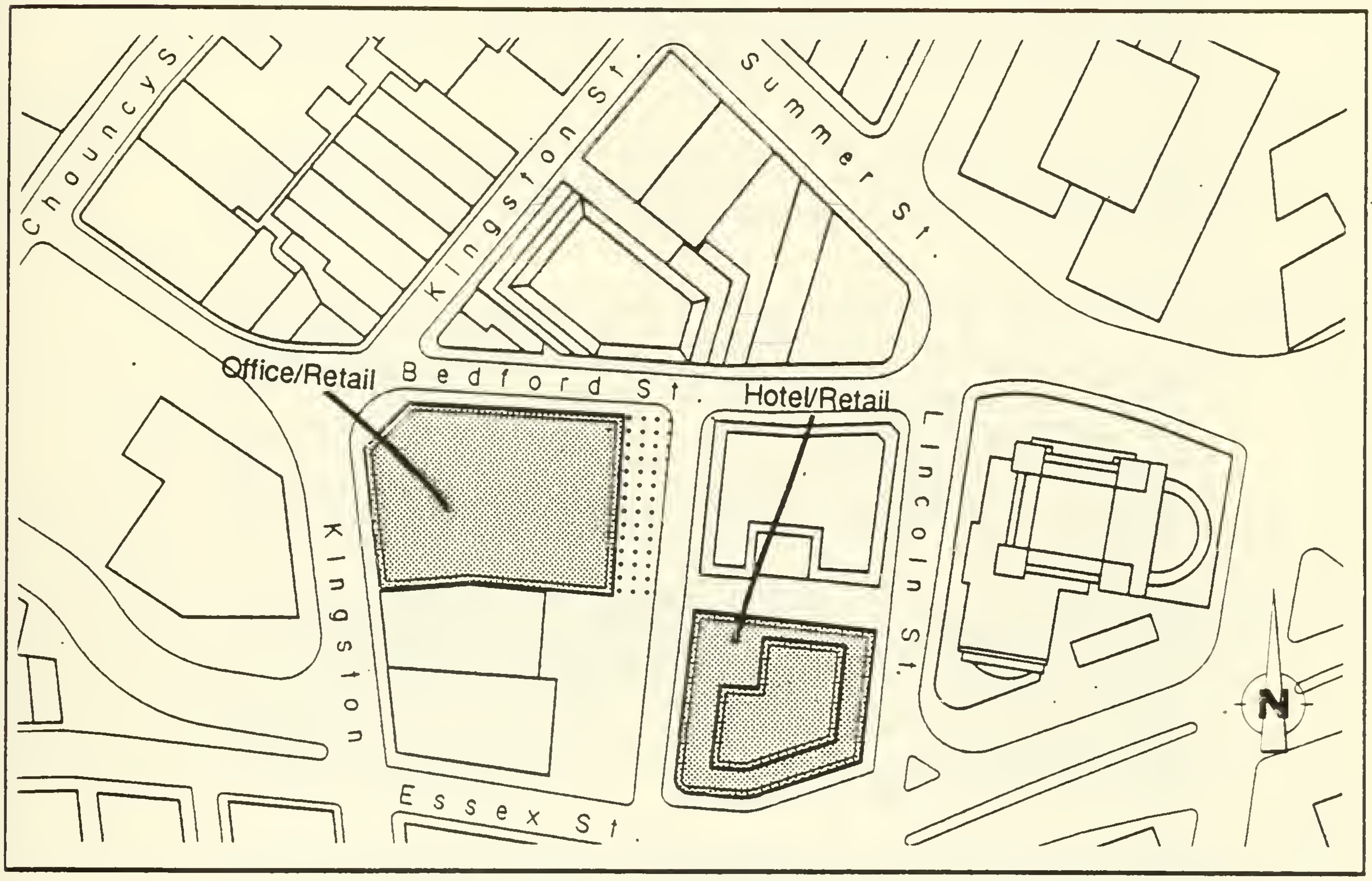


Figure IV I-4:
Open Space for 250 ft. Tower

The open space configuration for Alternatives 2 through 4 would be adversely affected by shadows. The park area at Bedford Street and Columbia Street would be affected by shadows, both existing and new, for all of the times analyzed in the shadow studies of this report. Shadow impacts on the pedestrian passageway would be similar.

The dimensions of these public spaces, together with limited vehicular access to Columbia Street, would provide a positive response to identified community open space needs by providing conveniently located, safe, and relatively quiet urban open spaces.

Alternative 5 and 6 are considerably different from Alternatives 2 through 4. Both assume that Essex Street would be widened and that Columbia Street would be closed to vehicular traffic so that the Kingston-Bedford Street and Essex Street blocks would essentially become one block. Alternative 5 proposes than an "L" shaped building be located at the intersection of Kingston-Bedford Street and that a rectangular building be placed at the intersection of Lincoln and Essex Streets facing Essex Street. Approximately 28,400 square feet of open space would be provided. Figure IV I-5 indicates the location of the open space for Alternative 5.

Alternative 6 proposes a single "L" shaped building extending along Essex and Kingston Streets with a tower located on the Essex Street block. Open spaces, totalling approximately 7,300 square feet, would be provided in the form of a landscaped public plaza at the corner of Essex and Kingston Streets, an enclosed pedestrian passageway along Columbia Street, and a pedestrianway connecting 125 Summer Street to the corner of Kingston and Bedford Streets. In addition, Alternative 6 would provide a multi-story public atrium. Figure IV I-6 indicates the location of the open spaces for Alternative 6.

Shadow impacts on the public plaza/pedestrian corridors proposed by Alternative 5 would be evident as the orientation of the buildings would shade the central space most of the day, especially in winter. However, the pedestrian plaza adjacent to Essex Street would be well situated in terms of minimizing potential shadow impacts. At a central location on the block, the public plaza contained in Alternative 5 would benefit from protection from traffic noise along Essex Street and the elimination of vehicles on Columbia Street.

The orientation of the tower on Alternative 6 would minimize the shadow impacts on the public plaza, shading the space only in the early morning hours. By locating the plaza at the northwest corner, the space would be directly accessible to Chinatown. The Columbia Street corridor would be in shade most of the day year round.

Table IV I-1 documents the overall amount of open space proposed for each of the development alternatives and shows that all of the build alternatives provide significantly more usable public open space than currently exists on the site. The build alternatives also have beneficial effects compared to the No-Build Alternative by providing some open space accessible to Chinatown.

PLAN VIEW

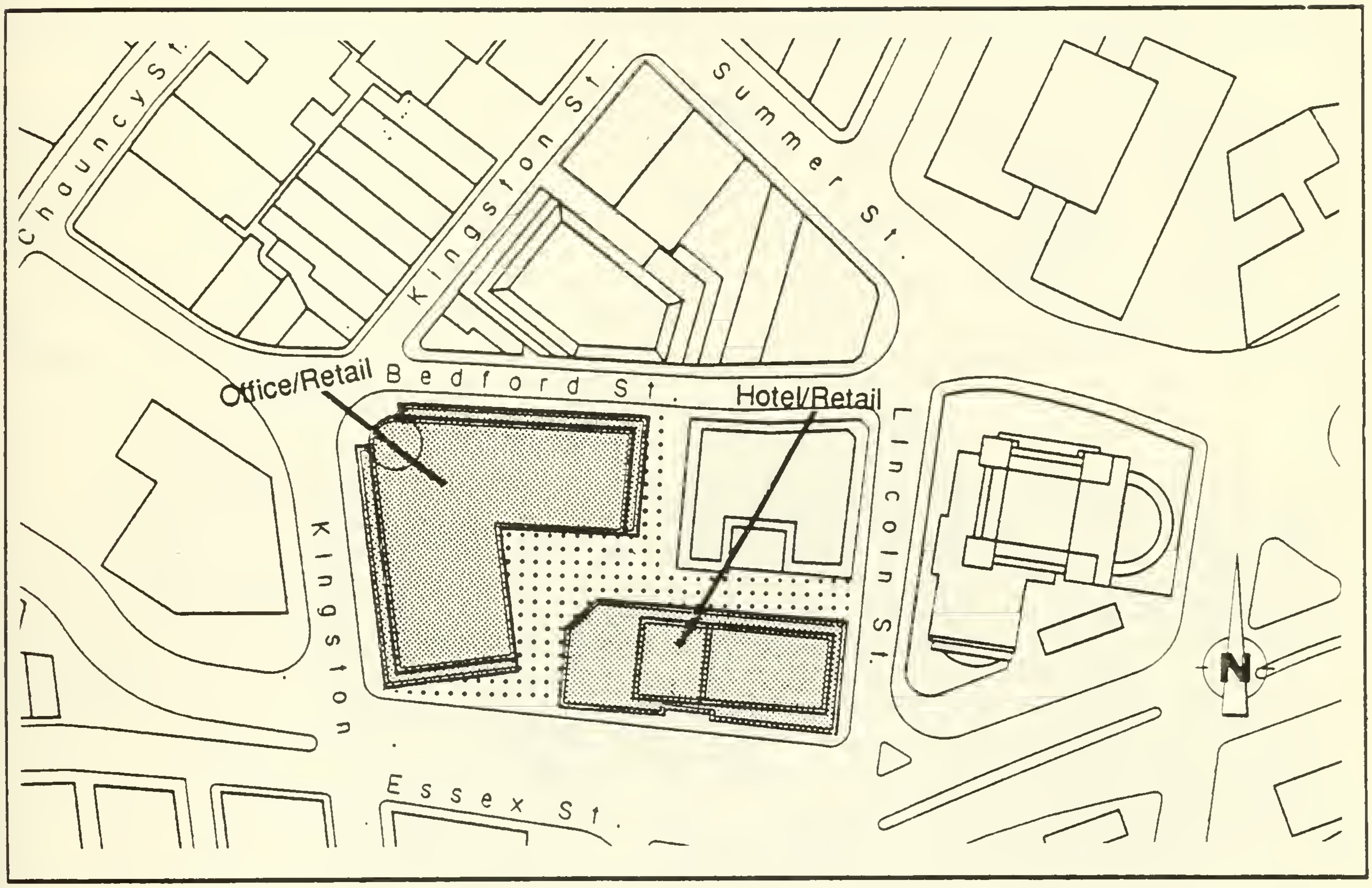


Figure IV I-5:
Open Space for Expended Site

PLAN VIEW

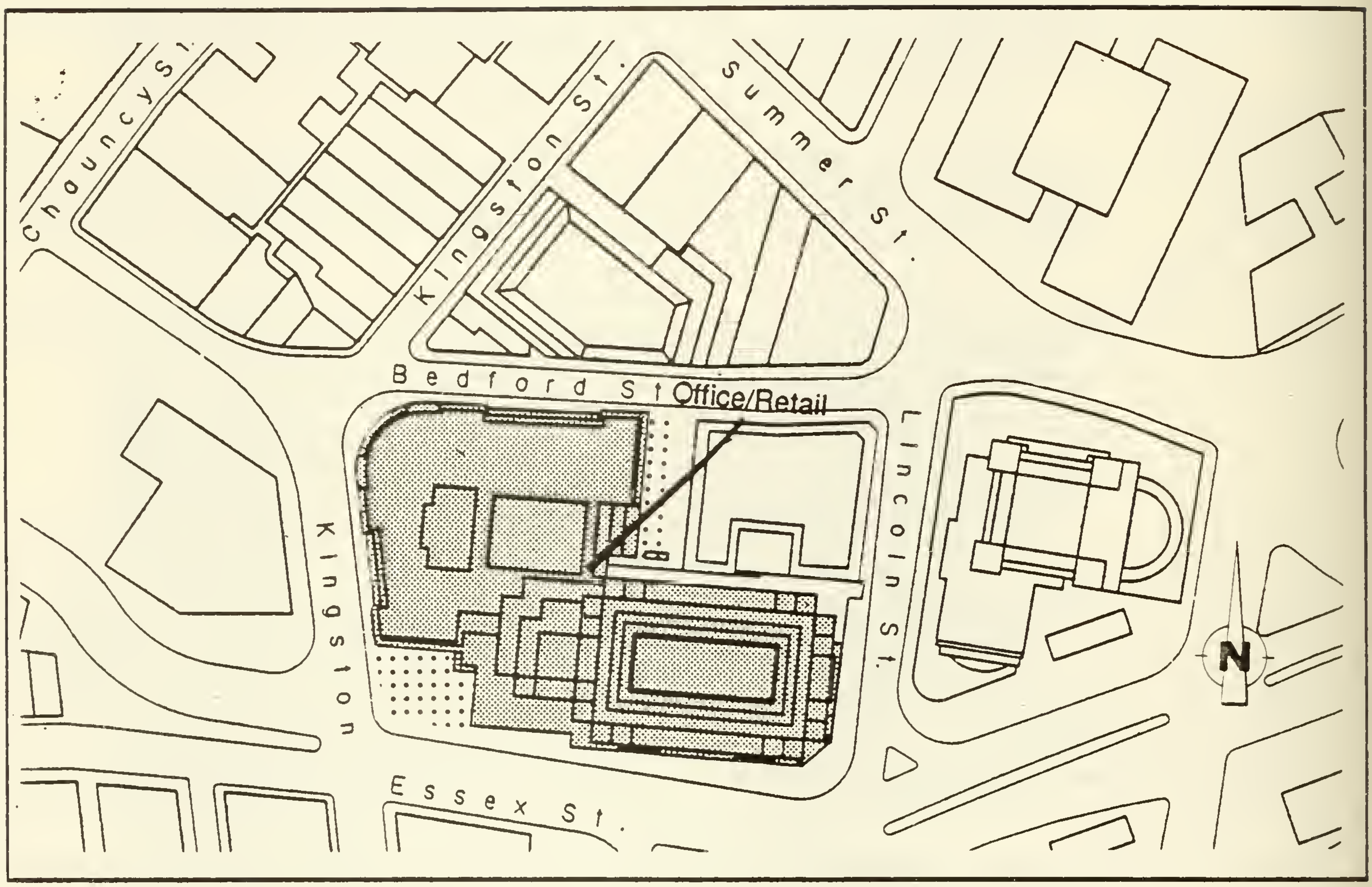


Figure IV I-6:
Open Space for Developer's Proposal

TABLE IV I-1

Open Space Comparison of the Alternatives

	Existing Conditions	Alternative 2-3-4	Alternative 5	Alternative 6
Site Area (sq.ft.)	48,174	48,174	75,664	75,664
Open Space (sq.ft.)	0	5,600	28,464	7,300
Total Open Space (sq.ft.)	0%	12%	38%	10%

Pedestrian Movement

The open space concept for Alternatives 2 through 4 proposes that the open areas be linked to Columbia Street and essentially act as one unified open space system. These open space areas would accommodate pedestrian movement and public seating, as well as a number of other public activities associated with the retail and hotel lobby uses located on the ground floors of the buildings. Under these alternatives, Columbia Street would act as the central pedestrian passageway with a public plaza at Columbia Street and Bedford Street. The geometry of the proposed open space/pedestrian network would be well organized to link to major existing and proposed pedestrian routes. These include connections through 99 Summer Street to the north and through 125 Summer Street to the east, which leads to South Station. The connection south across Essex Street to the Chinatown community would be used less, but it does provide for north/south through movements on-site. A proposed through-building pedestrian connection would link Columbia Street to Kingston Street.

In Alternative 5, a major public plaza is proposed at the center of the site with open pedestrian corridors linking to the northeast and south, and a through-building pedestrian connection leading to Kingston Street to the west. The northern pedestrian connection would be directly aligned with the 99 Summer Street pedestrian arcade, while the pedestrian corridor heading to Lincoln Street would be linked to the 125 Summer Street through-building connection. The connection to Chinatown to the south would be aligned to cross Essex Street closer to the Kingston Street intersection than is provided for in Alternatives 2 through 4.

Alternative 6 would provide an internal public circulation system that would cross the site in both the north/south and east/west directions. North/south movement would be facilitated by access from both the public plaza and the Lincoln/Essex corner through to Columbia Street, which is on axis with the 99 Summer Street pedestrian arcade. The east/west movement would connect 125 Summer Street to the Kingston-Bedford corner. As with the other alternatives, these connections would provide links to the larger Financial District/Dewey Square pedestrian ways. The Essex Street widening would provide opportunities to widen the sidewalks along this constrained pedestrian route.

Relationship to Off-Site Parks and Open Space

The open space proposed for each of the build alternatives would augment the existing open space resources of Chinatown. The character of the proposed spaces, as previously described, would provide for passive open spaces that would include public seating, landscaping, public plazas and pedestrian walkways, and through-building connections. Proposed retail activity at the ground floor would provide an opportunity to create an active and vibrant community space that would expand opportunities for retail markets and shops with associated street level activities. Alternatives 2 through 6 further would respond to the identified Chinatown community needs by providing an urban open space that is suitably dimensioned for sitting, informal gatherings, and through-movement for pedestrians.

Each of the build alternatives would substantially increase the on-site population in direct proportion to the amount and type of development proposed. Alternative 6, which has the largest proposed development program, would contribute the most incremental demand for open space resources. This demand would primarily be related to daytime activities for office workers. While the on-site open space proposed by each build alternative would offset a portion of the new demand, existing parks and open space resources in close proximity to the site (5-10 minute walking distance) could experience increased demands.

Mitigation Measures

Recognizing the urban nature of the site and relatively high traffic volumes on the streets which surround the Kingston-Bedford-Essex Street site, the safety and smooth flow of pedestrian circulation across the major streets will require signalized intersections. Other pedestrian improvements at key crossing zones (striping, enhanced paving, signage) also can provide appropriate mitigation measures. Of particular concern is the crossing of Essex Street, which has heavy volumes of traffic and, under Alternatives 5 and 6, would be widened. The Kingston Street/Essex Street intersection and the terminus of any public plaza from the site at Essex Street will require special treatment. This could include design features such special signs, lighting and paving, and pedestrian waiting areas. Pavement widths should be sized appropriately to the projected peak hour level of pedestrian activity. Future study of the peak hour pedestrian patterns to the site and within the site would provide valuable data for site specific open space and plaza design.

Potential noise impacts on public and semi-private spaces can be partially reduced through the use of dense plantings of landscape materials in association with architectural elements of buildings and barriers between the noise sources and the noise sensitive sites.

J. SOCIAL AND ECONOMIC ISSUES

Description of the Environment

The Kingston-Bedford-Essex Street site is in close proximity to Downtown Crossing, Church Green, Chinatown, Dewey Square, South Station and the Financial District. To the southwest is Chinatown. To the north, northwest, and east are major office and retail developments. The site lies within the Essex Street corridor, an area which has been identified in the BRA's Downtown Plan as a tract for new growth. In addition, the site is adjacent to and abuts buildings of major historic significance to Boston (see Section H).

Adjacent Neighborhoods

Chinatown

Chinatown is bounded by the Surface Artery and Southeast Expressway to the east, Massachusetts Turnpike to the south, Tremont Street to the west, and Essex Street to the north. Chinatown is distinguished from the other districts surrounding the Kingston-Bedford site as a densely populated Asian neighborhood that has evolved since the 1870s. Today, Chinatown is the Asian cultural, business, and social center of Boston and New England. In addition to being home to over 5,000 residents, it also hosts more than 60 community organizations and over 180 businesses and stores which serve the Asian community in the metropolitan Boston area.

Chinatown's 46 acres of land include two subdistricts: the business and commercial core to the north of Kneeland Street and the residential area to the south of Kneeland Street. In the 1960s, the New England Medical Center and the Tufts University Medical and Veterinary Schools became a dominant presence in the area. In 1974, the four-block Adult Entertainment District was created at the northwest corner of Chinatown.

The area is characterized by buildings not exceeding six-stories in height. Taller buildings ranging from seven to fourteen stories high do appear on Beach Street (the major commercial spine), along the Essex Street corridor to the north, and on major thoroughfares including Kneeland Street, Tremont Street, Washington Street, and the Massachusetts Turnpike. In 1980, about a third of the housing units were brick rowhouses constructed in the period from the late 1800's to 1939. Another one third were constructed between 1970 and 1974 in highrise housing projects. Aside from the Quincy School complex and the subsidized housing projects, the only major new constructions in the neighborhood were the Medical Center and related facilities.

Sites and buildings of unique architectural quality and/or social, historical significance dot the neighborhood, such as the Lee Family Association building and Ping-On Street where the first Chinese arriving in Boston pitched their tents about a century ago. Boston's Chinatown has since evolved as the fifth largest Chinatown in the United States with an increasing share of visitor- and tourist-oriented businesses.

Midtown Cultural District

The Midtown Cultural District stretches from the edges of Boston Common to Downtown Crossing, the Combat Zone, the Theater District, and Park Square. Despite the district's central location, it contains a high concentration of vacant land and underutilized historic buildings and theaters. As envisioned by the Midtown Cultural District Plan, which is one of the first products of the community-based planning process initiated in the 1987 Downtown Interim Zoning Plan, the district will be revitalized as a center of commerce, culture, and city life. Ultimately, the revitalization of the Midtown Cultural District will create a new mixed-use neighborhood of offices, homes, stores, restaurants, hotels, and cultural facilities.

Leather District

The Leather District is located in the southernmost portion of the Central Business District and is largely bounded and isolated by the railyards on Atlantic Avenue to the east, the Surface Artery to the west and north, and the Massachusetts Turnpike ramps to the south. South Station lies to the northeast. The district contains fifty-four parcels of land, on which stand mostly commercial buildings, along with an increasing number of living and working loft spaces. The area was redeveloped from a low-rent residential/commercial district for the shoe and leather trade, primarily during the 1880s and 1890s, with some later construction in the first quarter of the twentieth century largely located in the southernmost blocks bounded by Kneeland Street.

Chinatown Neighborhood Characteristics

Current Conditions

The current conditions in Chinatown were examined in a four-part survey conducted in 1987 by the BRA and the Chinatown/South Cove Neighborhood Council. The survey covered housing conditions, the characteristics of the neighborhood's residents and users, land uses, and business and employer characteristics. Additional information on employment was obtained through a survey conducted in 1988 on job expectation which was sponsored by the Neighborhood Council and the City. Augmented by 1980 census data and information from the BRA's 1985 citywide household survey, these recent surveys provide up to date information on current conditions, preferences, needs, and trends in Chinatown.

The People. Chinatown is not only a residential neighborhood, but also a regional commercial, cultural, and service center to the Asian community in New England. The diverse mix of people who live, work, visit, and shop form the unique core of the neighborhood.

Chinatown is primarily home to first-generation Chinese immigrants. Ninety-one percent of the residents are Chinese, while two percent are Vietnamese, Cambodian, or other Asian nationalities. Nearly two-thirds of Chinatown's residents were born in a foreign country. By contrast, only 33 percent of all of Boston's residents were born abroad.

The population of Chinatown has more than tripled since 1970 due primarily to an influx of Chinese and Vietnamese immigrants. The total population in Chinatown increased from 1,570 in 1970 to 3,522 in 1980 to over 5,100 in 1987. The increase in Asian population in Boston is expected to continue. By 1995, it is estimated that Asians will account for 24 percent of Boston's population, in comparison to 6.5 percent in 1985. While the city's Asian community has become increasingly diverse, the average age characteristics, household composition, educational attainment and labor force characteristics of Chinatown residents have changed little since 1970.

Chinatown tends to have more families, elderly residents, and children than other Boston neighborhoods. In 1980, six out of every ten households in Chinatown were families, compared to five out of every ten households citywide. One-fifth of the neighborhood's families have children who are five years old or younger, while 41 percent of all units currently house at least one elderly person.

Aside from the residents, a large number of people who shop, visit, work, or pass through Chinatown (44 percent) live outside of Boston. Only one in five is a resident of Chinatown. Fifty-five percent of all users were Chinese. Vietnamese and Cambodians totaled 8 percent of all users, with many of them coming from outside of Chinatown.

Many of the non-resident users come to Chinatown frequently or regularly. Fifty-four percent of the non-resident Chinatown users visit Chinatown daily, with 18 percent weekly and 15 percent by-weekly. Fifty-four percent of Asian users visit Chinatown daily, 23 percent weekly and 14 percent bi-monthly. Principal reasons for using Chinatown include eating (30 percent), working (24 percent), and shopping (24 percent).

<u>Education and Employment</u>. Educational attainment has been relatively low for Chinatown residents. In 1980, only 37 percent of the adults 25 years and older were high school graduates, compared to more than two-thirds citywide. Only 45 percent of Chinatown adults had completed any years of high school and only 12.8 percent of the 25 and under population had completed college, as compared to 20.3 percent citywide.

In 1980, labor force participation in Chinatown was 65 percent, higher than the citywide rate of 60 percent. However, a majority of the Chinatown residents have only low level jobs with low income. The unemployment rate for males in Chinatown was 4.4 percent and 10.6 percent for females. Comparable citywide unemployment rates were 7.1 percent for males and 5 percent for females.

The Chinatown workforce remained primarily in service and factory occupations, working in restaurants and shops and in garment manufacturing businesses which is an area in decline citywide. The decade between 1970 and 1980 saw fewer Chinatown residents participate in managerial and professional employment; in technical, sales, and administrative support; and in fishing and horticultural employment. During the same decade, service occupation participation rose from 30.3 percent to 36.9 percent. More Chinatown residents are also working in precision production, craft and repair. The largest employment gain was made by operators, fabricators, and laborers, with Chinatown participation increasing from 15.3 to 21.8 percent.

Income. For all families in Chinatown, the median income in 1979 was $10,553, or 66 percent of the Boston median of $16,062. That represented a nominal increase, but a relative decrease from 1969 when the median family income in Chinatown was $6,781, or 74 percent of the citywide median. While 23 percent of the Chinatown families had above $10,000 in income in 1969, 44 percent of all Boston families had incomes above $10,000.

During the 1970s, the incidence of poverty among families in Chinatown increased from 15.6 percent in 1970 to 19.0 percent in 1980. Poverty also increased in Chinatown among elderly residents, from 19.7 to 29.1 percent over the decade. In 1980, poverty rates in Chinatown were higher than rates for all Asians in Boston and for all residents of the city: 20.2 percent in Chinatown compared with 16.6 percent citywide for families; 24 percent in Chinatown compared with 22.4 percent citywide for individuals. The low income of Chinatown residents may be explained partly by the prevalence of retail and service jobs in the area, many of which offer low pay and part-time work.

In comparison, the median family income for people who use Chinatown for various purposes in 1987 was $22,500. A significant 13 percent of all users had incomes over $40,000, while another 14 percent had incomes below $10,000.

Housing. Chinatown's housing units are the most crowded in the city, and many are in poor condition. Within the Chinatown core area there are 1,478 housing units. At the time of the 1987 survey, 96.8 percent of the units were occupied, giving the area one of the lowest vacancy rates in the city. In 1980, 95 percent of the units were occupied by renters, compared with 70 percent citywide. The median housing payment for all Chinatown users was about $400 per unit.

Overcrowding is a serious problem in Chinatown. While the average number of adults per unit is 3.6, 25 percent of the units are occupied by five or more people. Ninety-four percent of Chinatown's housing units have only one bedroom. As a result, in 1980, 30.7 percent of the units had more than one person per room, which is the U.S. Census Bureau's definition of overcrowding. The overcrowding rate was almost six times higher than the overcrowding rate for the city as a whole. Contrary to the substantial increase in population, there has been only minimal addition to the housing stock.

Nearly one-half of the housing units in Chinatown are in three major subsidized projects. These projects were built between early and mid-1970s, primarily for the relocation of residents displaced by highway construction and the South Cove Urban Renewal Area activities. Many of the housing units in Chinatown are located on the upper floors of buildings. The same buildings house retail and commercial operations on the street level and lower floors.

Although the structural conditions of the older buildings in the neighborhood appear to be fairly good, a large number of the units are deteriorating. About one-third of the units surveyed had some defects in their floors, ceilings, doors, or windows. Accessible and private bathroom facilities were reportedly not available in 14 percent of all units. In addition, more than 50 percent of the 292 buildings in Chinatown have been identified by the City as having structural damages resulting from lowered groundwater levels and exposed wood pilings.

Commercial Activity and Workplaces. Chinatown has a thriving commercial sector. It is a regional center used by not only the residents of Chinatown, but also by Asian and non-Asian visitors. A total of 185 businesses are currently operating in Chinatown. These are mainly restaurants and bakeries; gift shops and specialty shops; grocery stores, drug stores, and markets; personal and professional services; wholesalers, factories, and importers/exporters; and facilities for entertainment, recreation, and cultural uses.

Professional and personal services make up the largest group of businesses in Chinatown, and account for about 29 percent of the total businesses. Collectively, food services make up almost half of the business, including restaurants and bakeries (25 percent), grocery markets (9 percent), and wholesale food markets (11 percent). Only a small percentage of businesses in Chinatown are light manufacturing. Entertainment facilities and shops make up about 12 percent and 10 percent respectively.

Workplaces in Chinatown are included in zip code area 02111, the smallest geographic unit for which data are available. This area, the Chinatown/Leather District, supported 19,000 jobs in a variety of business types. Health, education and social services accounted for nearly one-half of the area's employment. In 1981, manufacturing accounted for 4,300 jobs, 2,700 of which were in apparel and other textile products. Approximately 1,300 employees had jobs in printing and publishing, and electric and electronic equipment. Since 1983, a number of small apparel manufacturers have relocated, some to South Boston's Marine Industrial Park.

Community Services. Over the course of a century, Chinatown has built up a range of community services that are tailored for the various phases of immigration and family development. Some of these are geared toward the needs of the newcomers, ranging from counseling and orientation courses to job/housing referrals and employment programs. Others extend beyond the initiating period, such as the comprehensive health-related services provided by the South Cove Community Health Center, day care facilities operated by the Quincy School Community Council, elderly programs offered by the Golden Age Center, youth programs organized by the South Cove YMCA and the Chinese Youth Essential Services, and religious programs of the Chinese Christian Church and the Chinese Episcopal Church, among others. The expanding repertoire of cultural programs sponsored by such organizations as the Asian-American Resource Workshop, the Chinese Culture Institute, and the Greater Boston Cultural Association reflect the increasingly active Asian community.

Over the years, traditional organizations like the Chinese Consolidated Benevolent Association, the Chinese Merchants Association and other trade and family organizations have functioned as the cornerstone of the burgeoning immigrant community by providing a wide range of support services. Equally important are the many advocacy groups that emerged in the 1970s, such as the Chinese Progressive Association in the area of workers rights and welfare, the Chinatown Housing and Land Development Task Force in tenant rights and affordable housing, and the Asian-American Resource Workshop in public education and community advocacy through arts and multi-media. Meanwhile, groups like Chinese Economic Development Council and the newly formed Asian Community Development Corporation have begun to build up the development capacity in the community. Other organizations such as the Boston Urban Gardeners and

the Legal Service Institute also contribute to the range and quality of services available to the community.

Educational and Medical Institutions. Four major institutions have established a dominant presence in the Chinatown neighborhood, including the Quincy School, the New England Medical Center Hospitals, and the Health Science School Tufts University Health Sciences Campus. Quincy School, founded in 1847, is one of the oldest public schools in the nation. The School was relocated from its original home on Tyler Street to its new facility on Washington Street in 1970. Aside from the formal education programs offered by the Quincy School, Chinese students can attended the Kwong Kow Chinese School to study Chinese language, history, geography, and natural sciences in Cantonese. This school was founded in 1920 by the Chinese Merchants Association and continues to operate today at the Old Quincy School.

The historical presence of medical institutions in the Chinatown-South Cove neighborhood can be traced back to the Boston Dispensary Building constructed in 1883, the Classroom Building before 1900, and the Floating Hospital, an innovative pediatric clinic on the sea started in the 1890s, which joined the Dispensary in 1927 after the barge that housed the clinic was burned down.

More recent expansion of the medical institutions in the neighborhood was ushered in with the adoption of the South Cove Urban Renewal Plan in 1965. Today, the New England Medical Center is a major academic health center in downtown Boston. The Medical Center hospitals are also the primary teaching affiliates of Tufts University School of Medicine.

Abandonment and Disinvestment. There appears to be no discernible abandonment or disinvestment in the Chinatown neighborhood, from records kept by the City of Boston's Real Property Department. However, a significant number of buildings are currently underutilized or partially vacant on the upper floors. Many buildings also show signs of neglect and poor maintenance.

Property Values. There is some difficulty in analyzing property values in Chinatown due to the inability to compare the same property and its value over several years unless the property is sold. The problem is compounded by the varying methods of property assessment used over the past ten years. Since 1983, assessing methods have more accurately reflected property values than in previous years.

A comparison of the 1983 and 1987 assessed values for residential and residential/commercial properties on Beach, Tyler, and Harrison Streets indicates an average increase in value of 158 percent with $98,292 the average value in 1983 and $254,079 the average in 1987. A comparison of changes in assessed values for nearly all properties - residential and commercial - on Beach and Tyler Streets within Chinatown shows an average increase of 124 percent between 1983 and 1987. Increasing property values are likely to be intensified as a result of the redevelopment of the adjacent Midtown Cultural District.

Special Needs of the Community

To preserve its role as the center of the New England Asian community, Chinatown needs to improve on its residential and business environment. This will be accomplished through an increase in the supply of affordable housing, jobs and business opportunities, and space for cultural functions and other community support activities.

<u>Housing</u>. Housing in Chinatown needs to be improved and expanded.

° Affordable Housing

The supply of affordable housing remains among the top priorities in a neighborhood characterized by low household income and high density.

There are currently over 2,000 persons on the waiting lists for a total of 615 units in the four major low-and moderate-income housing in Chinatown which include Oxford Place, Quincy Tower, Tai-Tung Village, and Massachusetts Pike Tower. A large portion of the potential tenants for the Massachusetts Pike Tower and the Tai-Tung Village are presently living in and around Boston, including the South End, Allston-Brighton, Quincy, and Lawrence, among other places.

There exists a significant demand for larger units, especially 3-bedroom ones. In the past, many families have moved out of Chinatown for want of suitable housing.

Congregate elderly housing is also in strong demand as is evidenced by the number and the popularity of such developments in the Chinatown/South Cove/South End area, including the Quincy Tower, the South Cove Manor Nursing Home, the Hong Lock House, and the Chauncy House. Many elderly persons prefer to move into the neighborhood from other areas because of Chinatown's convenience, services, and companionship.

° Housing Ownership

While the demand for affordable housing is evident, market-rate housing needs to be judiciously incorporated to ensure the continued development of a socially and economically viable neighborhood.

° Housing Development Sites

In view of the limited sites for new housing construction and the severe housing shortage in the neighborhood, additional opportunities need to be explored to improve housing supply in Chinatown.

In addition to new construction on public land, other development options have to be examined, including rehab and conversion of existing buildings, many of which are currently under-used. Housing development opportunities in the adjacent areas also need to be explored.

Employment. In order to diversify the employment base and upgrade employment levels, Chinatown will require support for higher education, improvement in language skills and child care, along with a better information network, referral services and job access.

° Support for Higher Educational Attainment

Although there is a relatively high labor force participation among the Asian population in Chinatown, poverty rates in the neighborhood are higher than rates for all residents of the city. It may be partly attributed to the prevalence of retail and service jobs in the area, many of which offer low pay and part-time work. The relatively low level of employment corresponds with the low level of educational attainment which did not improve significantly in the 1970s, contrary to the citywide trend.

The need for encouraging and supporting qualified but needy students for higher education was reflected in the priority it received during the community's negotiation with the Tufts/New England Medical Center in 1983. In addition to contributing $100,000 for the establishment of a Community Scholarship Fund, Tufts University also was required to actively recruit Asian-American students. Measures such as these to further educational attainment will be essential to improving the employment opportunities for the Chinatown workers over the long run.

° English as a Second Language (ESL)

Deficiency in English is a common problem for a significant portion of the foreign-born residents in Chinatown. Language is particularly a problem with the adult population in Chinatown, compounded by the low level of educational attainment. Lack of English language skills also has contributed to the under-employment of the recent immigrants from the South East Asia who are otherwise qualified, well-educated professionals.

Presently, adult ESL programs at various levels have been offered by community organizations such as the Chinese American Civic Association (CACA), the Chinese Economic Development Council (CEDC), and Quincy School Community Council (QSCC). All three programs have experienced continuing growth in demand. The enrollment at the CACA consistently has increased by 15 to 20 slots over the past four years. At present, about 300 students attend the 16 classes structured in five levels daily. About 150-200 persons are currently placed on the waiting list. Meanwhile, the enrollment at QSCC's Adult ESL programs grew 34 percent between 1985 and 1987. With the 1987 addition of a computer lab, the combined waiting list increased 114 percent between the same two-year period. CEDC's Adult ESL programs routinely maintain 75 persons on the waiting list at the beginning of each new classes. However, despite the obvious demands, the number of classes at CEDC have decreased from five to two for want of qualified bilingual teachers.

° Vocational Training and Retraining

The Chinatown community would benefit from augmented vocational training and retraining programs. These programs should be aimed at upgrading employment levels for individuals and, at the same time, diversifying opportunities for the community as a whole.

Training and retraining programs need to be designed to match anticipated market demand. In addition, training programs for permanent jobs offered by specific development projects need to be designed and coordinated with the particular project development.

° Child Care

A large proportion of the Chinatown residents in the labor force also need child care service, as indicated by 67 percent of the respondents to a recent survey on job expectations. Over one half of the respondents take care of two or more children. Seventy-five percent indicated they needed whole-day service and were able to pay less than $200 per month for child care.

The need for child care is also demonstrated in a growing waiting list despite the increase in facilities. Between 1985 and 1987 alone, the enrollment in QSCC's Day Care Center grew 20 percent, as did the number of children on its waiting list.

<u>Neighborhood Business and Entrepreneurship</u>. Aside from preserving and expanding existing neighborhood businesses, Chinatown needs to diversify its economic base through the development of new businesses. Opportunities for growth and expansion provided through the revitalization of the adjacent Midtown Cultural District must be maximized. In addition, small scale neighborhood businesses and services that are the back bone of the Chinatown community need to be protected from displacement.

° Preserving and Expanding Small Businesses

Nearly three-quarters of the businesses in Chinatown have fewer than five employees. Typically, a shop in Chinatown averages about 800 square feet, while a professional/personal service office averages about 650 square feet. Notable exceptions are restaurants and grocery stores/wholesale/super markets, occupying an average floor area of 3,800 square feet and 6,600 square feet respectively.

Over one half of the businesses in Chinatown would like to expand at their current location or to another location in or near Chinatown. Over 40 Asian businesses are currently operating in the lower Washington Street area, leading that area's commercial revitalization. Special efforts need to be devoted to ensure that these neighborhood-based small businesses will not be priced out by other development. Opportunities for small businesses to continue to expand into the surrounding districts need to be preserved.

° Reinforcing and Diversifying the Economic Base

A large number of Chinatown's businesses are relatively new. One-half of the businesses have started operation within the past six years. Grocery stores and markets have the longest history with few new ventures. In contrast, despite the long history of the restaurant industry in Chinatown, it has the largest number of new openings and quick turn-overs. In all, a large percentage of the personal and professional services, such as beauty parlors and travel agencies, are relatively new, with 57 percent of these services in operation for two to five years and 63 percent for less than six years. A marked increase is seen in gift shops and jewelry stores. Recently the number of Vietnamese-Chinese restaurants has also been increasing, reflecting the growing Southeast Asian community.

Aside from the increasing demand from the continued growth of the Asian community, the planned revitalization of the adjacent Midtown Cultural District will expand the clientele and patronage of traditional Chinatown businesses and services. In addition, there will be new opportunities in construction and businesses associated with development. The Chinatown community has to seize on these economic opportunities to expand the existing economic base.

° Supporting Business and Entrepreneurship Development

Small businesses and new entrepreneurs may need marketing, business planning, management, and financing assistance to take full advantage of new business opportunities.

This support could include cost cutting and risk-reducing business arrangements such as incubator space for retail or office, pushcarts and other forms of mobile vendors, and in-house entrepreneurship training programs.

Cultural and Other Community Support Facilities. The unique social and cultural environs of Chinatown comfort, support, and educate different generations of Asian immigrants.

° Affordable Space and Funding

There is definitely a shortage of community facilities and qualified bilingual staff. Affordable space remains a top priority for many of the community organizations and service providers. The plight of the South Cove YMCA, which has yet to find a permanent home in a community it has served nearly seven decades, is shared to various degrees by other organizations.

To address the shortage in programming space, innovative approaches as to the management and operation of facilities need to be explored. These could include such arrangements as time-sharing, rotating space, and common space, as well as incubator space. To maximize the resources, joint sponsorship of programs has already proven successful. A successful precedent has been set by the consortium formed by the CACA, the QSCC, and the COTC which recently received over $200,000 for a coordinated language and vocational training program that will benefit over 150 members in one calendar year.

° Elderly, Youth and Children

Support facilities for the elderly, youth, and children warrant special attention. There is a shortage of open space and recreational facilities. Cultural changes within the community are also altering the family structure. There is increased need for community facilities outside the home for children and the elderly.

° Cultural and Art Programming

Aside from the continuous inflow of families and relatives of the first generation immigrant workers, a large number of visiting Asian students, scholars and professionals also continue to converge on the area. Chinese or ethnic Chinese from Hong Kong, Taiwan, China, Singapore, and Malaysia seek to become involved with the Chinese community. Recent refugees from Cambodia and Vietnam further infuse the diverse make-up of the community.

For many of these Asian immigrants, temporary residents and visitors, Chinatown serves as a vital resource for those who choose to maintain their ethnic identity and lifestyles. With the arrival of the second and third generations of Asian-Americans, the need to acquaint them with the Chinese cultural heritage has grown parallel with the assertion of a distinct immigrant history and identity which is consolidated by Chinatown.

Given the emergence of satellite Asian enclaves in the region and the revitalization of the adjacent historic theater district as the city's premier cultural and performing arts center, Chinatown's traditional role as a cultural center needs to be reinforced and its diverse resources fully explored.

Probable Impacts of the Alternatives

All of the build alternatives will result in economic development in one of the few remaining downtown sites targeted by the City for commercial activity. The only other underutilized area in downtown Boston that has been designated to accommodate similar development is the North Station area. At the same time, the Midtown Cultural District to the west of the Essex Street-South Station area is targeted by the City for revitalization into a mixed-use neighborhood made up of offices, homes, stores, restaurants, hotels, and cultural and performing arts facilities.

For Chinatown residents, businessmen, service providers, and the Asian community who have long claimed the adjacent area southwest of the project site, the proposed development presents the dilemma of both opportunity and uncertainty for the continued growth of the historic ethnic neighborhood.

On the one hand, linkage housing, jobs, businesses, and other much needed neighborhood enhancement measures would be created. On the other hand, the many low- and moderate-income families and small businesses that typify Chinatown are extremely susceptible to displacement as a result of escalating property values. The uncertainty is compounded by the cumulative impact to be expected from other major development projects in the immediate vicinity of the neighborhood, such as the Commonwealth Center, Boston Crossing, and the South Station expansion.

Successful revitalization of the neighboring Midtown Cultural District combined with public improvements in traffic and transit that are planned for the midtown and downtown areas will certainly add to Chinatown's attractiveness as a prime choice for residence and new commercial development.

Property value in the vicinity of the proposed development may increase, yet it is evident that this increase is not solely accounted for by the Kingston-Bedford-Essex Street development alone. The eventual effects of increasing property values and other associated impacts depend on public policy supporting the continued enhancement of Chinatown and on choices made by property owners in the Chinatown community.

Presently, Chinatown is a community at a crossroad. For more than 30 years, the neighborhood has faced encroachment by highway builders, large institutions, and the entertainment district. To address the needs of Chinatown, the Chinatown-South Cove Neighborhood Council has coordinated the development of a master plan to guide construction of new housing, expand existing businesses, and support new economic enterprises. The final community plan, along with the zoning plan for the Chinatown neighborhood, will be completed in 1989 and will subsequently be recommended to the City for formal adoption as the general plan governing the future planning and development of the neighborhood. With the general evaluation framework thus established, the probable effects of the proposed development on housing and the economic base services are evaluated below.

Housing

Chinatown is primarily home to first generation Asian immigrants. A majority of them are poor and hampered by limited education and/or a language barrier. Gross rents paid by these residents are relatively low compared with the average gross rent citywide. It is unlikely that Chinatown residents could afford the higher rents associated with increased property values.

According to records at the City's Rent Equity Board, the long-term affordability of about 78 percent of the existing 1,313 housing units in Chinatown has stabilized. The affordability of rental units is further enhanced through the enactment of the recently expanded City Ordinance 34. The Ordinance governs and regulates rent, eviction, and condominium conversion for housing units constructed and/or maintained with government funds.

The possibility of increasing the stock of affordable housing for Boston residents is remote without additional government assistance. One source of additional funding for affordable housing in the Chinatown neighborhood will be the housing linkage contributions generated by commercial developments in the Midtown Cultural District and the Kingston-Bedford project. Projected office development in the district will eventually generate about $25 million in housing linkage funds. Some of these funds will help to finance the City-sponsored Chinatown Housing Improvement Program, which aims to create 500 units of housing in Chinatown with at least two-thirds of these units being affordable to low- and moderate-income families.

Unfortunately, the construction of new affordable housing in the Chinatown neighborhood is restricted by limited land resources. City policy now calls for all remaining public sites in Chinatown to be dedicated to housing. To further address the shortage of development sites in the Chinatown neighborhood, at least another 300 affordable housing units will be built in the Midtown District for Chinatown families. In all, there is the potential for 800 additional housing units to be created in the neighborhood and the adjacent midtown area for the Chinatown community. Two community-based development corporations have recently received tentative designation as the developer to build 260 housing units on the R-3/R-3A site, the primary city-owned housing site, in Chinatown. At least 170 units will be affordable to low- and moderate-income families. The project is scheduled to break ground in 1990.

Several of the housing developments will help address the acute need for additional housing have already received subsidies, including housing linkage contributions from commercial developers, to make the units affordable. Tremont Village is a recently-completed residential development located in Bay Village/South Cove. In all, twenty units of housing were recently developed by the Chinese Consolidated Benevolent Association for low-income residents with financing provided by the Massachusetts Executive Office of Communities and Development. The Waterford Place project is a residential development planned for a site in the South End. The developer, the Chinese Consolidated Benevolent Association, plans to develop 40 units of rental housing on the site, with a minimum of 66 percent of the units affordable to low-income families. The project is financed with a housing linkage contribution made by the developer of the downtown project at 125 Summer Street, Perry/Jaymont Venture.

Table IV J-1 indicates the range of housing linkage funds that would become available under the six development alternatives for the Kingston-Bedford site.

TABLE IV J-1

Housing Linkage Funds

Alternatives	Linkage Contribution
1: No Build	$0.00
2: 400 ft. Tower	$4.00 million
3: 325 ft. Tower	$3.15 million
4: 250 ft. Tower	$2.40 million
5: Expanded Site	$3.15 million
6: Developer's Proposal	$4.6 0 million

The linkage funds from development of Kingston-Bedford-Essex Street and Parcel 18 will be combined and shared equally by the Chinatown and Roxbury communities.

Economic Base

The current economic base of the Chinatown neighborhood stands out in two aspects: (1) a labor force with high concentration on low-paying and labor-intensive jobs in restaurant and service industries; and (2) a neighborhood-based business network typified by small-scale operations and limited participation in the larger realm of the City's economic structure.

BRA research has estimated that downtown employment growth by 1990 would appear mainly in the construction, manufacturing, financial, and service industries. Most of the development projects currently underway or being considered for the downtown and midtown areas are devoted to office, retail, hotels, and market-rate housing.

As currently projected, the revitalization of the neighboring Midtown Cultural District will produce a total of 8,500 construction jobs and 15,000 net new permanent jobs for office, retail, hotel, residential, cultural, parking, and daycare workers.

Table IV J-2 shows projected employment for the Kingston-Bedford-Essex Street project. Approximately, one-half of these jobs are expected to go to personnel in the legal and finance sectors. On-site jobs generated for advertising and retails would make up a small portion of the total employment picture.

TABLE IV J-2

Projected Employment

Alternatives	Construction Employment	Permanent Employment
1: No Build	0	0
2: 400 ft. Tower	0	3,102
3: 350 ft. Tower	1,015	2,544
4: 250 ft. Tower	655	2,005
5: Expanded Site	825	2,513
6: Developer's Proposal	1,135	3,600

Aside from jobs created on the various downtown and midtown development sites, the influx of workers, residents, and visitors will also generate additional demand for a wide range of support services, retail, and entertainment facilities located in the adjacent areas. The additional demand would not only increase the clientele and patronage of the many restaurants, gift shops, and personal and professional services already operating in Chinatown but also generate new businesses and services.

However, without creative intervention, most of these multiple economic opportunities created with a vibrant economy and downtown development will elude the Chinatown community. Construction jobs and permanent on-site jobs created by the proposed project, like other downtown development, may bring only limited, low-level openings to the Chinatown community. Limited educational attainment, language problems, and inadequate information network, as well as a lack of adequate and affordable child care, remain key obstacles to improving the employment conditions for the immigrant community. Minority participation in development related businesses and enterprises has remained low. To date,

the Chinatown community like other minority communities in the City has yet to establish a significant foothold in the downtown real estate development.

Meanwhile, existing small businesses located on prime downtown development sites, such as the forty Asian businesses operating in the lower Washington Street area, could be up-rooted. Expansion opportunities for the traditional neighborhood businesses that serve the growing Asian community could also be reduced or replaced by establishments that will cater to non-community patrons and clients. Some intervention measures have already been enacted, most notably in the recently adopted Midtown Cultural District Zoning Plan. To protect existing businesses, developers of major development in the midtown district are now required to provide adequate relocation assistance. To ensure the expansion opportunity for small businesses while at the same time reinforce an active commercial street environment, a small business expansion zone has been instituted along streets that interface with Chinatown, including portions of Washington Street, Essex Street, Chauncy Street, and Harrison Avenue. In addition, large scale development in the district will be required to provide neighborhood business opportunities through affirmative action in accordance with specific regulations.

Mitigation Measures

The proposed Kingston-Bedford-Essex Street project, as part of the City's first Parcel-to-Parcel Linkage program, seeks to promote and expand economic access and fairness for the minority communities. Many of the following measures have been devised and adopted as an integral part of the Parcel-to-Parcel Linkage Program and are intended to reduce the negative impacts of development projects on the socio-economic conditions in Chinatown and Roxbury.

Housing

The Parcel-to-Parcel Linkage Program would accommodate the development of housing by targeting the developer's housing linkage contribution to Chinatown for the creation of affordable units. A housing linkage contribution is required by Article 26A of the Boston Zoning Code. For commercial projects greater than 100,000 gross square feet in size and which require zoning relief, developers must contribute $5 per square foot, exclusive of the initial 100,000 square feet of the project. Payments are made to the Neighborhood Housing Trust over a period of 6 or 12 years, depending on whether the project is located downtown or in a neighborhood. Payment begins when the project receives a building permit. The trust funds are then allocated through a competitive process to create affordable housing city-wide. Alternatively, a developer may elect the Housing Creation Option, targeting the contribution to a specific project and neighborhood. Payments may be discounted to their net present value and paid up front to create the housing sooner than would occur with payments over time. The developers of the Kingston-Bedford-Essex Street site intend to pursue the Housing Creation Option and, further, will prepay $1 million of the payment at final designation, which is prior to receipt of a building permit.

Housing linkage funds from the Parcel-to-Parcel Linkage Program, including the Kingston-Bedford-Essex Street and Parcel 18 sites, will be shared equally between Chinatown and Roxbury. A likely recipient of funds for affordable housing development in Chinatown is Parcel R-3/R-3A, a BRA-owned site in Chinatown which two community organizations will develop.

In addition to linkage, other public subsidies are available to help increase the supply of affordable housing and could be used in Chinatown to the benefit of the community. There are currently six State programs available through the Executive Office of Communities and Development that assist low- and moderate-income families and the non-elderly, handicapped/disabled in obtaining affordable housing. These programs subsidize construction of new buildings, rehabilitation, and adaptive reuse, and provide funds for acquisitions. In one program, the Boston Housing Authority purchases units in private developments and rents them at below-market rates. Other programs provide rent subsidies or below-market mortgages, while still others underwrite the construction of infrastructure or provide interest payment writedowns to 5 percent.

In addition, a goal of Mayor Flynn's administration is to expand affordable housing opportunities for Boston residents. The basic means used to achieve this goal is the disposition of BRA and City-owned property. On all publicly-owned parcels of land which are available for housing development, many of which are located in Roxbury, affordable housing is required.

To ensure that race or other factors are not barriers to housing, the Boston Fair Housing Law requires that each individual, regardless of race, color, religious creed, marital status, military status, handicap, children, national origin, sex, age, ancestry, sexual preference, or source of income shall have equal access to housing. Affirmative marketing likewise is required on housing developments subsidized by the Massachusetts Housing Finance Authority. At the State level, the Executive Office of Communities and Development has adopted standards and procedures to ensure fair, equitable, and non-arbitrary procedures for selecting applicants to occupy State-assisted housing units and for transferring current tenants, to promote fair housing and tenant selection practices, and to prevent discrimination and segregation.

Improvement of Employment Skills and Opportunities

The prospect for Chinatown residents to qualify for employment opportunities made available by the Kingston-Bedford-Essex Street project will be enhanced by the availability of job training programs funded through the Jobs Linkage Contribution. The City is able to generate funds for job training, in part, through the linkage requirements of the Boston Zoning Code. For projects greater than 100,000 square feet in size and which require zoning relief, developers must contribute one dollar per square foot, exclusive of the initial 100,000 square feet of the project.

To ensure community participation in the selection and prioritization of employment services to be funded by the job linkage contribution generated by the proposed project, a Request for Proposal process will be developed by the Mayor's Office of Jobs and Community Services in conjunction with the Chinatown Neighborhood Council.

The developer has committed to a goal of achieving a minimum of 30% employment for minorities and will institute outreach efforts to that end. To provide training for minorities in real estate activities, the developer has committed $400,000 as a grant.

In order to gain access for residents to permanent jobs on the site, the developer will work with tenants of the development to reach the City's hiring goals of 50 percent Boston residents, 30 percent minorities, and 10 percent women. Outreach activities and training programs will help to attain these goals.

Minority Business Enterprises

A minimum 30 percent participation by minority business enterprises in construction contracts and professional and technical services budgets has been established as one of the Parcel-to-Parcel Linkage Program objectives. Minority business opportunities include those in engineering, architecture, law, marketing and leasing, construction and management, personnel and hiring, construction contracting, construction supplies and services, and furnishings.

Economic Base

The Parcel to Parcel Linkage Program will increase the economic base in Roxbury and Chinatown through requirements regarding minority equity participation and participation by minority-and women-owned business enterprises. The program calls for a minimum of 30 percent equity participation by a minority development team to include community-based organizations. Following a competitive selection process, tentative designation was awarded to the joint venture (Metropolitan/Columbia Plaza Venture) formed by Columbia Plaza Associates, the minority development team, and Metropolitan Structures, each with a 50 percent interest. The Columbia Plaza Associates is a joint venture of the Chinese Investment Limited Partnership (CILP) and Ruggles-Bedford Associates, Inc. (RBA), with CILP holding a 40 percent interest and RBA a 60 percent interest. The CPA represents a broad range of Boston's Asian-American, Black, and Hispanic entrepreneurs and institutions. The minority team will include community-based organizations as 10 percent owners of Columbia Plaza Associates.

The program calls for reserving a minimum of 30 percent of all development-related consultant contracts for certified minority- and women-owned businesses. Through the community-based selection process, the Venture has also committed to setting aside a portion of retail and/or commercial space on-site for minority business enterprises at reduced rents.

In addition, the Venture will work with public and private agencies to provide technical assistance to minority businesses and encourage the formation of a small business incubator program. Active outreach efforts will be made to ensure that information concerning the timing and nature of business opportunities generated by the development project will be made available.

Community Facilities and Other Benefits

The program requires the developer to provide child care facilities with the capacity for 200 children, with 100 slots in Roxbury and 100 slots in Chinatown. The goal is to construct child care facilities for each community with programs that will maximize the potential for learning and development of children utilizing the centers. The developer will provide $5,000 in order to conduct design/program seminars for residents and child care providers of both communities and will provide another $2,500 for the writing of the state-of-the-art child care design/program that evolves as a result of the seminars. The facilities may be lo-

cated on- or off-site. The Chinatown Neighborhood Council, the developer, and the City currently are exploring what options are the most appropriate.

Planning Grant

To facilitate substantive community participation in the two linkage projects, the developer has committed to a planning grant totalling $100,000 over the next two years to the respective community review bodies -- the Chinatown-South Cove Neighborhood Council and the Parcel 18+ Task Force. This grant will be matched by the Boston Redevelopment Authority's contribution in the same amounts.

Community Development Fund

The Metropolitan/Columbia Plaza Venture will contribute to a proposed Community Development Fund that will be capitalized by 10 percent of the developer's fee, 5 percent of the net operating income from available project cash flow, and 10 percent of the net proceeds of refinancing or sale proceeds. Monies from this fund can be used to support community development in various areas of special needs, such as venture capital for new businesses, expansion of existing establishments, physical improvements and beautification, gap financing for affordable housing, and social services. It is estimated that $10-18 million will be generated for this fund.

In addition to the Parcel-to-Parcel Linkage Program, the impacts of the proposed project will be affected to some large extent by the outcome of the community-based master plan and rezoning effort that are currently underway in the Chinatown neighborhood. The Chinatown Community Plan and the Chinatown Neighborhood District Zoning Plan are scheduled for adoption by the City in the spring of 1989. The two plans will be further supported by additional programs and actions jointly developed and implemented by the Chinatown community, the City, and other public and private entities to reinforce Chinatown as an historic ethnic neighborhood and a regional cultural, commercial, and service center that will enrich the city as a whole.

In addition, a comprehensive needs assessment for community services and a feasibility study for a facility to house the South Cove YMCA, the Chinatown Boys' and Girls' Club, and other community services are underway. An historic conservation initiative is also being explored to preserve Chinatown's unique cultural identity and historic character.

In summary, the community benefits which accrue from the Kingston-Bedford-Essex Street, in conjunction with the Parcel 18 Linkage project in Roxbury, should exceed those proposed for any other project to be built in Boston. While mitigation measures typically seek to redress adverse impacts of a specific development, in the case of the Kingston-Bedford-Essex Street project, the socio-economic mitigation measures seek to address an even broader set of social concerns -- the economic revitalization of Boston's minority communities.

K. CONSTRUCTION

Construction Schedule

Construction of the Kingston-Bedford-Essex Street project is anticipated to begin in January of 1990 with a completion date in the summer of 1992. Construction is planned to begin on the Kingston-Bedford Street garage site first for Alternatives 2, 3, 4, and 5, followed by construction on the Essex Street site. For Alternative 6, construction on the entire site would commence simultaneously. For Alternatives 2, 3, 4, and 5, more time would be required for the construction of the Kingston-Bedford Street portion of the project, as this building would be approximately three times larger than the Essex Street site building. In the case of Alternative 6, the single structure would consume the entire construction time.

Alternatives 2, 3, 4, and 5

For Alternatives 2, 3, 4, and 5, construction on the Kingston-Bedford Street garage site would occur over a 21-month period. The demolition of the existing garage at the Kingston-Bedford Street site would be expected to commence in the fall of 1989. The first step in this phase of construction would entail the removal of any asbestos or hazardous materials in a controlled manner and in accordance with the requirements of the Commonwealth. Next, the existing structure would be demolished, the foundation removed, and the utilities capped off just beyond the outside edge of the proposed building. Excavation of the building foundation would start in January, 1989 and entail digging out the underground parking levels, constructing cribbing or slurry walls, and dewatering the site. This phase of construction would take approximately six months to complete. The foundation construction would commence in June of 1990 and take approximately three and one-half months to complete. During this phase of construction, piles (if required) would be driven, the basement floors and walls would be poured, and the utilities would be brought into the building. The erection of the superstructure would start in November of 1990. After a few of the floors have been erected, the finish work would then commence. The erection and finish work should be completed by August, 1992.

The at-grade parking lot on the Essex Street site would be taken out of service during the winter of 1990. Excavation on this site would commence then and take approximately two months to complete. The foundation work is expected to commence in the summer of 1991 and be completed in 3 months. Erection of the infrastructure should commence in the fall of 1991. The finished work would start after the first few floors are erected. Construction would be completed in the fall of 1992.

Alternative 6

Alternative 6, the Developer's Proposal, consists of construction activities covering the full site, including the Kingston-Bedford Street and Essex Street portions of the site. Because this alternative covers the full site, the two buildings at the corner of Kingston and Essex Streets would have to be acquired from the private owners. Excavation would commence in January of 1990 with foundation construction commencing in October of 1990. The erection of the infrastructure would commence in the winter of 1990 and the entire development would be completed in the fall of 1992.

Transportation-Related Construction Impacts

The chief transportation impacts that are of concern during the construction period are traffic impacts on streets leading to and around the site, worker parking, unloading and storage of construction materials and equipment, and the enclosure of the site to protect pedestrians. All these matters require City licensing, and both good planning and coordination are necessary to ensure that construction period transportation impacts are minimized to the greatest extent possible.

Existing corridors of high pedestrian and vehicular traffic have the most potential to be adversely affected. The current areas of heaviest pedestrian traffic occur along Summer Street. This area has heavy use due to transit patrons accessing Washington and Park Street stations to the north and South Station to the south. Major transportation corridors within this area include the Surface Artery, Essex Street, Bedford Street, Lincoln Street, and Summer Street. The construction plan and operations must be so developed as to minimize use of these streets by construction vehicles and construction workers to the greatest extent possible, particularly during peak hours.

A detailed Construction Management Plan will have to be prepared by the project developer in close coordination with the construction contractor for submittal for approval by the City's Transportation Department prior to issuance of a building permit. At this time, only the principles and concepts of such a plan can be articulated.

Some limitations exist in detailing a Construction Management Plan during the public approval process and months in advance of construction itself. The City permits and controls require specific input from the responsible City agencies, which must take into account expected conditions at the time of construction, including coordination with other public, private, or utility construction going on at the same time. With this in mind, it is possible to state a number of principles, as follows, which would govern the construction process in order to reduce negative impacts.

To plan for the least disruptive constructive period, the phasing of construction work should be coordinated with other construction activities in the area. Likewise, the components of the overall development must be staged so as to minimize transportation-related and other construction impacts. The project with the greatest potential conflict is the Central Artery/Third Harbor Tunnel project, where peak construction years are currently estimated to be 1990-1994 and earliest construction on the tunnel portion is scheduled to commence in 1989. In order to minimize impacts to truck deliveries to the Kingston-Bedford-Essex Street project site, a truck delivery plan must be proposed.

Trucks making deliveries northbound on the Central Artery would exit at Lincoln Street and go directly to the site. Trucks making deliveries southbound on the Central Artery would exit at South Station, turn right on Summer Street and left onto Bedford Street. Trucks would be able to exit onto Essex Street and follow the Surface Artery to the Central Artery entry points.

During the time when the Essex Street site would have available vacant space, this area can be used for staging and for storage of materials and equipment. For example, steel beams could be stored on tractor trailers parked at the Essex Street site and transferred to the Kingston-Bedford garage site via a crane on Columbia Street. Likewise, two cement truck delivery sites should be established -- one on Columbia Street and the other at the corner of Columbia and Bedford Streets near the vacant area. Off-site staging of steel trucks should be provided to reduce area congestion.

For all staging and materials storage areas and activities, detailed plans to minimize impacts would be set forth in the Construction Management Plan and would require close coordination and monitoring in order to assure that there would be the least possible disruption to pedestrians and commuters. This would include coordination with the Construction Management Plans of other nearby developments that will be underway at the same time as the Kingston-Bedford-Essex Street construction period.

Workers at the site should be encouraged to use transit, ride share, or park at off-site locations in order to reduce their contributions to traffic and parking around the construction site to the greatest extent possible. Parking spaces would not be supplied on site for workers. The Construction Management Plan would outline specific ways in which the contractor is to communicate with workers and to cooperate with the Boston Transportation Department in order to minimize worker parking impacts.

Impacts to pedestrians around the site would be mitigated by the construction of fencing around both construction and staging areas. In addition, a lighted, covered pedestrian walkway should be provided along the south site of Bedford Street and the east side of Kingston Street during the appropriate stages of construction.

Noise and Vibration

Noise

The different stages of construction identified in the construction schedule would have different noise characteristics as presented in Table IV K-1. The highest noise levels would occur during ground clearing, excavation, and finishing, while the other construction phases generally are quieter. Thus, the highest noise intrusions within the project area would be expected to occur during the fall of 1990 when the work on the Kingston-Bedford Street garage site would have commenced erection operations and ground clearing and excavation would have commenced for the Essex Street site. Although the overall noise level for foundation construction is not as high, the use of a conventional drop-hammer pile driver can result in noise peaks of 110 A-weighted decibels or more during this phase of construction. However, this noise is intermittent rather than continuous but would still be annoying to the surrounding environment.

TABLE IV K-1

Typical Ranges of Noise Levels at Cconstruction Sites With a 70 dB(a) Ambient Typical of Urban Areas

Construction Phase	Major Noise	Energy Average dB(A)*	NPL**
Ground Clearing	Truck, Scrapper	84	99
Excavation	Front Loader, Backhoe Tractors, Trucks	89	104
Foundations	Pile Driver, Compressors Concrete Mixer	78	85
Erection	Cranes, Compressors	85	97
Finishing	Compressors	89	104

Source: US EPA, Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances. 1971

* dBA refers to A-weighted decibels which best represents frequencies which are most annoying to the human ear.

** NPL (noise pressure level) is defined as the sum of the A-weighted average sound pressure level and 2.56 times the standard deviation of the A-weighted sound pressure level.

Construction noise is regulated by the City of Boston to limit it at the lot line of office and retail property to no more than 80 decibels. Therefore, none of the construction activities (except impact devices) may legally exceed the 80 decibel noise level. No significantly different noise impacts are anticipated to occur among the five build alternatives, except perhaps for duration where a larger proposed building program would typically take longer to complete. However, the construction of any of the alternatives would cause impacts on the pedestrian environment along the streets adjacent to the site, including Essex, Lincoln, Kingston, and Bedford Streets.

The passage of construction trucks along the delivery routes can elevate peak noise levels above 91 decibels. A noise assessment was conducted to determine the adverse noise impacts to sensitive noise receptors. The methodology described in the report published by Bolt, Beranek and Newman (1983) was used for the assessment. Due to the limitations of this methodology, the number of vehicles was set at 100, although there would be considerably fewer per day. All receptors were located 15 feet from the source. Based on this analysis, the design noise level which equates to the noise generated by trucks over a twenty-four hour period was 45 decibels.

Based on the U.S. Department of Housing and Urban Development criteria (Bolt, Beranek and Newman, 1983), this level is acceptable for residential land use. Although each truck passage would result in a high noise peak, the cumulative effect would be relatively insignificant compared to the other noise sources in the area.

Vibration

The primary source of construction-related subsurface vibrations would be pile driving activities associated with foundation construction, should this type of construction technique be used. The main potential off-site impact of pile driving on the site is damage to adjacent structures caused by induced vertical and lateral soil displacement. Kezdi (1975) stated that "driving piles into clay can cause structural movements for a distance equal to the length of piles driven." Since piles at the Kingston-Bedford-Essex Street site would probably have to be driven through a marine clay layer to highly compacted glacial till, structural movements could, therefore, be expected for distances up to approximately 50 feet from any pile location. However, the radius of heave (short-term surrounding soil uplift greater than 1 inch and settlement greater than 2 inches) would probably be up to 50 percent less, based on empirical data presented by Kezdi (1975).

Reinforced concrete pile driving-induced vertical ground vibrations can fall off to negligible levels within 220 feet of pile location (Kezdi, 1975). However, that distance can vary with the material through which the vibration passes. The Kingston-Bedford-Essex Street site has several subsurface layers each of which would transmit vibrations unevenly and to varying distances. Through refraction, the vibrations can also travel along the boundary between surficial sand, silts and gravels, and the underlying marine clay.

Foundations

The proposed buildings and underground parking structures would be founded on spread footing or on piles. Piles would either be impact driven, vibratory, or preaugered. Alternatives 2 and 5 would have a 7-level subsurface parking structure underlying the site. Alternatives 3 and 4 would have a 6-level subsurface parking structure and Alternative 6 would have a 5-level subsurface parking structure, covering a similar underground layout. Construction of the subsurface parking structure will require the excavation of the surficial material and involve dewatering while the foundations are built. Total depth of excavation is expected to approximate 77 feet for Alternatives 2 and 5, 66 feet for Alternatives 3 and 4, and 55 feet for Alternative 6. Assuming an average surface elevation of 20 feet and an average groundwater table of approximately +8 feet NGVD, dewatering operations could result in a substantial static water level drop because excavation would be conducted up to approximately 65 below the existing water table for Alternatives 2 and 5, 54 feet for Alternatives 3 and 4, and 43 feet for Alternative 6. This substantial amount of excavation and associated dewatering could have an impact on the surrounding water table by lowering it to a point where any nearby wooden piles would be exposed. If left uncovered by water, the piles would deteriorate over time.

Shallow strata generally lowers the groundwater table by approximately one foot over a distance of 400 feet from the site (Haley and Aldrich, 1985). Structures built more than 25 years ago in the vicinity of the site were probably founded on wooden piles; therefore, dewatering over an extended period (more than 3 months) or on a permanent basis would result in wooden pile deterioration and soil consolidation/heave. Structures and utilities near the site could experience direct, differential, and "pile drag" settlement because of this deterioration and consolidation. The probability of such impacts is small, however, especially if the dewatering is minor and of short duration.

Dust, Debris, and Emissions

During the period of construction of the proposed development, some short-term adverse impacts on air quality would occur. An increase in air-borne particulate matter would occur in the form of fugitive dust from demolition, ground excavation, mounds of stored earth and aggregate, concrete construction, and carpentry works and similar activities. The extent of dispersion of this dust would depend on the nature of wind conditions, construction activities, transfer methods, particulate dimensions, and mitigation measures.

The major dust-emitting activities would occur during demolition of the Kingston-Bedford Street garage and during construction activities involving excavation and foundation work. Principal on-site sources of particulate matter include excavation processes and exposed aggregate, earth storage, and building materials. For each source type, emissions would depend on such factors as the properties of emitting surfaces (e.g., soil silt content, moisture content, and volume of spoils), meteorological variables, and the construction practices employed. It is anticipated that emissions from excavation activities could be significant for the project site because of the large amount of foundation excavation required for the subsurface parking facilities.

Exposed earth removed in the process of excavation, and gravel, sand, and concrete, etc. dumped on the site are potential dust emitters during mechanical disturbances and transfer operations; as well as during high winds. In either case, the bulk of the dust is emitted shortly after the initial loading of a freshly processed aggregate because it is during this period that the fine particles are most easily dislodged. Subsequent rainfall moistens the interior of the mounds and the moisture is released very slowly. Thus, the emissions from storage mounds depend primarily on the regional precipitation/evaporation (PE) index. The PE index is a measure of the precipitation to evaporation ratio and, in the contiguous United States, ranges from a low of 10 (highly conducive for dust particles) in the arid southwest to approximately 170 (not conducive for dust particles) in the upper northeast. In the Boston area, the PE index is 132, well above the average for the U.S. as a whole. This would indicate the potential for only a moderate amount of fugitive dust generation from construction operations if standard construction dust mitigation measures are enforced.

Debris from construction is another form of pollution that will be generated on the site. This waste material would include wood, plastic sheeting, wrapping materials, and trash resulting from construction operations. The developer will need a plan to remove such waste/debris from the site frequently to assure that it does not create a waste problem in the community.

Asbestos (a group of magnesium silicate mineral fibers), often used in the past in commercial buildings because of its incombustibility, insulation against heat/cold/noise, flexibility, good dielectric qualities, and great tensile strength, is another potential pollutant, especially during demolition of some older buildings. The asbestos fibers can be inhaled from airborne dust. Inhalation of asbestos fibers is associated with a number of health problems including asbestosis, lung cancer, mesothelioma, and pleural plaques.

Extreme precautions are required in the handling and removal of asbestos material. Prior to the handling and removal of asbestos, the United States Environmental Protection Agency (USEPA) and the Massachusetts Department of Environmental Quality Engineering (DEQE) must be notified twenty (20) days before the commencement of any demolition.

For handling and removal of asbestos materials at the site, strict health and safety measures must be taken to prevent workers involved in the removal operations from becoming contaminated. The workers must wear protective clothing and respiratory masks. Decontamination procedures must be maintained at the site in such case. All of the precautionary measures and procedures required by the USEPA and DEQE must be followed.

The area containing the asbestos material must be sealed off. Wetting agents should be used to wet down the asbestos material. The asbestos material must be dismantled and placed in double lined plastic bags marked "hazardous waste". Also, each bag must be properly labeled to provide information on its contents and to specify its destination.

Other Construction Activities

Several developments planned in the immediate vicinity of the Kingston-Bedford-Essex Street site are likely to have construction phases that will overlap with construction activities on the site. These planned developments include 125 Summer Street, the Central Artery Depression, and Boston Crossing.

Potential cumulative construction related impacts (traffic, noise, and air quality) may occur depending on the actual construction schedules for development of the Kingston-Bedford-Essex Street site and those other projects identified above. Should schedules overlap to a large degree, truck traffic would increase along Essex Street and the Surface Artery, with an increased level of concern for noise and air quality. In addition, construction staging areas and construction worker parking could become issues, depending on the ability of each development to provide adequate on-site and off-site solutions.

Mitigation Measures

Construction Schedule, Materials Movement, and Staging Areas

Coordination of construction schedules, truck routing, and staging areas between the Kingston-Bedford-Essex Street site and other projects in the area should be comprehensively undertaken once preliminary construction schedules have been established. This activity will be coordinated by the City of Boston through its construction management review process. The Boston Transportation Department requires that a construction management plan be approved prior to the issuance of a building permit by the Inspectional Services Department.

In order to minimize traffic and pedestrian disturbances, the following measures should be incorporated into the construction management plan:

- Limit truck deliveries to off-peak travel hours;
- Park semi-tractor trailer trucks on the Essex Street staging area, rather than on public access ways;

- Provide fencing around the staging areas to protect pedestrian traffic near the construction site;
- Require construction workers to access the site via public transportation, ride sharing, or parking at off-site locations;
- Provide a lighted pedestrian walkway surrounding the site along the south side of Bedford Street, the east side of Kingston Street, the north side of Essex Street, and the west side of Lincoln Street during the appropriate stages of construction.

Noise

Most of the noise during construction on the project site will be derived from internal combustion engines. These sources are usually diesel powered with most of the noise emanating from the exhaust outlet and, to a lesser extent, inlet and structural sources. The replacement of diesel powered engines with quieter gasoline engines or steam generators can result in some significant noise attenuation. Other noise mitigation devices, such as outfitting equipment with proper mufflers and intake silencers, aid in the management of construction noise.

Much of the construction noise which occurs above ground level cannot be readily attenuated. Therefore, the developer should adhere to the following construction practices:

- No on-site construction activity should commence prior to 6 AM or terminate later than 6 PM, unless extended hours are necessary to maintain the project schedule;
- All equipment should be well maintained and in proper working order;
- Impact tools and other sources of excessive noise should be fitted with state-of-the-art noise suppressors or enclosed in sound absorption chambers to reduce noise levels to applicable local guidelines;
- Pedestrians should be encouraged to remain at a safe distance from the site. Closing Columbia Street would be an effective noise mitigation measure;
- Whenever practicable, the least noisy means of construction should be used;
- Whenever feasible, the least noisy equipment should be used (e.g., electric instead of diesel-powered equipment);
- Noisy equipment should be kept as far as practicable from nearby sensitive receptors;
- Equipment should not be permitted to idle unnecessarily;
- Stationary noise generating equipment should be enclosed whenever practicable.

Vibration

The primary method to mitigate the potential impact of subsurface transmission of pile driving, should this construction method be required, and pile vibrosinking vibratlons is to substitute the preaugered or "Frankl pile" type installation method for the impact methods. Unlike impact pile driving, in which piles are driven to refusal, the "Franki pile" preaugered piles are installed by drilling and, then, impact driven for the last 5 to 10 feet. While this method is considerably more expensive than impact pile driving, it is recommended, particularly if the impacts of pile driving or vibrosinking are determined to be unacceptable based on preliminary engineering studies.

To assess specifically potential effects on adjacent structures, a ground control survey of adjacent streets and structures prior to excavation and pile installation is recommended, as well as structural assessment and documentation of the physical conditions of adjacent buildings prior to construction to determine if precautionary lateral support or under-pinning is advisable. This is especially critical with respect to the abutting, and historically significant, Bedford Building.

Groundwater

To track the actual groundwater impacts and potential effects on adjacent wood piles, the following mitigative measures are recommended:

- Monitor the groundwater levels, as required, adjacent to the site. This can be accomplished by installing observation wells as may be needed to obtain sufficient groundwater level data proximate to the site prior to construction. If the dewatering effort, by whatever method employed during construction, causes a drawdown adjacent to the site such that wood pile foundations would emerge from below the water table, the monitoring program would identify this condition.
- The frequency of monitoring should be such that a realistic recordable groundwater trend can be determined from the data.
- To minimize any potential problems associated with dewatering, excavation and subsurface foundation construction should not take longer than 6 months to 1 year to complete. However, the foundations and piles of previous on-site structures that may still exist in the site could present some delays during the excavation period. Dewatering effects could be further mitigated by the installation of cutoff walls prior to the start of dewatering.
- Should monitoring during the course of construction indicate that wood pile foundations are exposed to the atmosphere for a period greater than three months, a recharge program should be implemented. This may consist of a series of injection wells or surface application, provided adequate infiltration into the soil can be achieved. Such recharging has been successful in the past (Haley and Aldrich, 1985).

Groundwater withdrawn from the site should be pumped to a siltation settling tank/basin to remove fine material, prior to discharge to the existing storm drain system. The expected duration of the dewatering operation would be approximately one year. If a dewatering program is designed to maintain ambient groundwater levels with appropriate mitigation measures, no adverse effects should be expected during or after construction.

Dust, Debris, and Emissions

Mitigation measures which may be employed to reduce fugitive dust emissions from construction activities include minimal storage of excavated soil and aggregate on the site, periodic wetting of earth mounds on a scheduled basis, minimizing disturbance of loose materials, and storing materials away from pedestrian walkways. Containment of other construction materials and miscellaneous trash should be controlled by proper on-site supervision. Also, early removal of waste materials from the site would mitigate much of the potential problem.

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VI. DISTRIBUTION LIST

The Draft Environmental Impact Report (DEIR) is being distributed to the State and City agencies and other interested parties listed below, as required by MEPA regulations, including those which attended the 1986 scoping session.

State Agencies

Executive Office of Environmental Affairs
- MEPA Unit
- Department of Environmental Quality Engineering

Executive Office of Communities and Development
- State Clearinghouse
- Department of Community Affairs

Executive Office of Transportation and Construction
Governor's Office of Economic Development
Massachusetts Bay Transportation Authority
Massachusetts Aeronautics Commission
Massachusetts Department of Public Works
Massachusetts Historical Commission
Massachusetts Water Resources Authority
Metropolitan District Commission
Metropolitan Area Planning Council

City Agencies

Office of the Mayor
Boston Housing Authority
Boston Transportation Department
Boston Water and Sewer Commission
Boston Public Works Department
Boston Parks and Recreation Department
Boston Department of the Environment
Boston Landmarks Commission
Boston Air Pollution Control Commission
Mayor's Office of Jobs and Community Services
Mayor's Office of Neighborhood Services

Public Officials

State Senator William M. Bulger
State Representative Sal DiMasi
Councilor Thomas M. Menino
Councilor James E. Kelly
Councilor Michael J. McCormack
Councilor Robert E. Travaglini
Councilor Christopher Iannella
Councilor Rosaria Salerno

Institutions and Individuals

Asian American Resource Workshop
Asian Community Development Corporation
Bay Village Neighborhood Association
Boston Theater District Association
Boston Urban Gardeners
Castle Square Tenants Association
Chinatown Boys' and Girls' Club
Chinatown Housing and Land Development Task Force
Chinatown Neighborhood Council
Chinatown Occupational Training
Chinatown People's Progressive Association
Chinese American Civic Association
Chinese Burmese Association
Chinese Christian Church of New England
Chinese Consolidated Benevolent Association of New England
Chinese Cultural Institute
Chinese Economic Development Corporation
Chinese Evanglical Church
Chinese Evangelical Society
Chinese Merchants Association
Don Bosco Teçhnical High School
Downtown Crossing Association
Golden Age Center
Josiah Quincy School
Leather District Neighborhood Association
Legal Service Institute
Mass. Assoc. of Chinese from IndoChina
Mass. Pike Tenants Association
Mason Place Residents Council
Maryknoll Sisters
New England Medical Center
Parcel 18+ Task Force
Philip B. Herr & Associates
Quincy Community School Council
South Cove Community Health Center
South Cove YMCA
Sun-Sun Company
Tai Tung Village Tenants Association
Tufts University (Physical Plant)
Youth Essential Services
Thomas Carey
Peter Chan
Frank Chin
Warren L. Eng
David Ng
James N. Yee
Kenneth K. Yee
Stephey Yee
Shirley Yuen

VII. LIST OF CONTRIBUTORS

The Boston Redevelopment Authority assumed the primary responsibility for the preparation of this Draft Environmental Impact Report for the Kingston-Bedford-Essex Street site, along with assistance and comments from the Massachusetts Bay Transportation Authority, City of Boston Department of Transportation, City of Boston Environment Department, and the Chinatown Neighborhood Council. The following lists the contributing technical consultants by chapter.

Chapter I - Executive Summary

Kramer Associates

Chapter II - Environmental Setting

Kramer Associates

WCH Industries, Inc.

Sasaki Associates, Inc.

Chapter III - Development Alternatives

Kramer Associates

WCH Industries, Inc.

Chapter IV - Environmental Issues

A. **Transportation & Related Issues**
Howard/Stein-Hudson Associates

B. **Air Quality**
WCH Industries, Inc.

C. **Noise**
Sasaki Associates, Inc.

D. **Utilities**
WCH Industries, Inc.

E. **Massing & Shadow**
Sasaki Associates, Inc.

F. **Aeronautics**
WCH Industries, Inc.

G. **Wind**
Rowen Williams Davies & Irwin, Inc.

H. Historic & Archaeological Resources
Sasaki Associates, Inc.

I. Open Space and Recreational Facilities
Sasaki Associates, Inc.

J. Social & Economic Impacts
Kramer Associates

K. Construction Impacts
WCH Industries, Inc.

Sasaki Associates, Inc.

Appendix A: Environmental Notification Form and MEPA Scope

1. Environmental Notification Form
2. Comment Letters on Environmental Notification Form
3. MEPA Certificate and Environmental Impact Report Scope

APPENDIX A
COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS

ENVIRONMENTAL NOTIFICATION FORM

Do not write in this space

I. SUMMARY

A. Project Identification
1. Project Name Kingston-Bedford/Essex St. Development
2. Project Proponent Boston Redevelopment Authority
Address Boston City Hall
Boston, MA 02201

B. Project Description: (City/Town(s) Boston
1. Location within city/town or street address Bedford and Kingston Sts. and 140 Essex St.
2. Est. Commencement Date: Spring 1988 Est. Completion Date: Spring 1990
Approx. Cost $ 67.5 - 105 Million Current Status of Project Design: 5 % Complete

C. Narrative Summary of Project
Describe project and give a description of the general project boundaries and the present use of the project area. (If necessary, use back of this page to complete summary).

The Kingston-Bedford Essex Street development project envisions the redevelopment of two City-owned parcels located in the financial district of downtown Boston for a major general-use project to include office, retail, hotel and residential uses in either one or two mid-or high-rise buildings. A landscaped public plaza offering street life and pedestrian amenities may be formed by the closure of Columbia Street to vehicular traffic. The existing Kingston-Bedford garage structure would be demolished to accommodate this new development.

At the present time, three alternative massing options are under consideration for the commercial/office/hotel/residential development in the two buildings that could be developed on the site. Maximum heights under consideration range from 155 to 250 feet on the Essex Street parcel and 250-400 feet on the Kingston-Bedford parcel. In no event will the total gross footage exceed 900,000 square feet for both buildings. In addition, public parking for an estimated 600-850 cars would be provided on the sites.

The Kingston-Bedford garage parcel, located at the corner of Kingston- and Bedford Streets, is approximately 27,426 square feet in area and currently is occupied by a 750-car mechanical garage. The second parcel - 140 Essex Street - is a 20,757 square foot parcel improved with an asphalt parking lot for 78 cars. The parcel is bounded by Columbia, Essex, and Lincoln Streets and abuts the historic Bedford Building.

(continued on back page.)

Copies of this may be obtained from:
Name: Richard B. Mertens Firm/Agency: Boston Redevelopment Authority
Address: Boston City Hall, Boston, MA 02201 Phone No. 722-4300, X323

1979

THIS IS AN IMPORTANT NOTICE. COMMENT PERIOD IS LIMITED.
For Information, call (617) 727-5830

The proposed project sites are adjacent to Chinatown, one of Boston's most unique residential neighborhoods. Chinatown houses one of Boston's oldest neighborhoods, and a thriving economy and culture.

It is the intent of the Boston Redevelopment Authority to prepare a Draft Environmental Impact Report evaluating the alternative development concepts under consideration for the Kingston-Bedford/Essex Street parcels. Following public review of this DRaft EIR, the Authority will issue a Request for Proposals which will lead to the selection of one or more developers to implement the program. A final EIR will be prepared by the chosen developer(s).

The project will be reviewed by the Chinatown Neighborhood Council. The BRA will recommend that the Council achieve maximum input from the diverse organizations action in Chinatown, including the Chinese Consolidated Benevolent Association, the institutional entities that are in the area, including but not limited to the New England Medical Center, the Downtown Crossing Association, Center City Task Force, The Boston Preservation Alliance, representatives from the Leather District and the Theater District. In addition, the council should invite the participation by institutions.

The Boston Redevelopment Authority understands "project" in this context to mean the totality of public policy goals and objectives (enumerated in Section IV A) and the overriding objective of maximizing community benefits and minimizing adverse impacts. This position is taken because of our understanding of the critical relationship between what will make this a good project and what will be good for the community. In our understanding they are the same things. An open, fair, public process, economic participation by the local community, and sensitive urban design are critical to the success of this project.

The development of this parcel will be linked to the development of Parcel 18 in Roxbury under the City's Parcel-to-Parcel Linkage Program.

A separate EIR will be prepared simultaneously for the Parcel 18 project.

Use This Page to Complete Narrative, if necessary.

This project is one which is categorically included and therefore automatically requires preparation of an Environmental Impact Report : YES X NO ______

D. Scoping (Complete Sections II and III first, before completing this section.)

1. Check those areas which would be important to examine in the event that an EIR is required for this project. This information is important so that significant areas of concern can be identified as early as possible, in order to expedite analysis and review.

	Construction Impacts	Long Term Impacts		Construction Impacts	Long Term Impacts
Open Space & Recreation		X	Mineral Resources		
Historical		X	Energy Use	X	X
Archaeological			Water Supply & Use		X
Fisheries & Wildlife			Water Pollution		
Vegetation, Trees			Air Pollution	X	X
Other Biological Systems			Noise	X	X
Inland Wetlands			Traffic	X	X
Coastal Wetlands or Beaches			Solid Waste	X	X
Flood Hazard Areas			Aesthetics		X
Chemicals, Hazardous Substances, High Risk Operations			Wind and Shadow		X
			Growth Impacts		X
Geologically Unstable Areas			Community/Housing and the Built Environment		X
Agricultural Land					
Other (Specify) ______					

2. List the alternatives which you would consider to be feasible in the event an EIR is required.

1. Alternative project massings and scales
2. Alternative project uses
3. Alternative project phasings

E. Has this project been filed with EOEA before? Yes ____ No X
If Yes, EOEA No. ____ EOEA Action? ____

F. Does this project fall under the jurisdiction of NEPA? Yes ____ No X
If Yes, which Federal Agency? ____ NEPA Status? ____

G. List the State or Federal agencies from which permits will be sought:

Agency Name	Type of Permit
Massachusetts Division of Water Pollution Control (DEQE)	Sewer Connection Permit
Metropolitan District Commission	Industrial User Permit
Boston Landmarks Commission	Determination of Effect Historic Properties
Boston Redevelopment Authority	Land Disposition Agreement

H. Will an Order of Conditions be required under the provisions of the Wetlands Protection Act (Chap. 131, Section 40)?
Yes ____ No X

DEQE File No., if applicable: ____

I. List the agencies from which the proponent will seek financial assistance for this project:

Agency Name	Funding Amount
Executive Office of Communities and Development	Community Development Action Gran
U.S. Department of Housing and Urban Development	Urban Development Action Grant

II. PROJECT DESCRIPTION

A. Include an original 8½ x 11 inch or larger section of the most recent U.S.G.S. 1:24,000 scale topographic map with the project area location and boundaries clearly shown. Include multiple maps if necessary for large projects. Include other maps, diagrams or aerial photos if the project cannot be clearly shown at U.S.G.S. scale. If available, attach a plan sketch of the proposed project.

B. State total area of project: 1.1 acres
Estimate the number of acres (to the nearest 1/10 acre) directly affected that are currently:

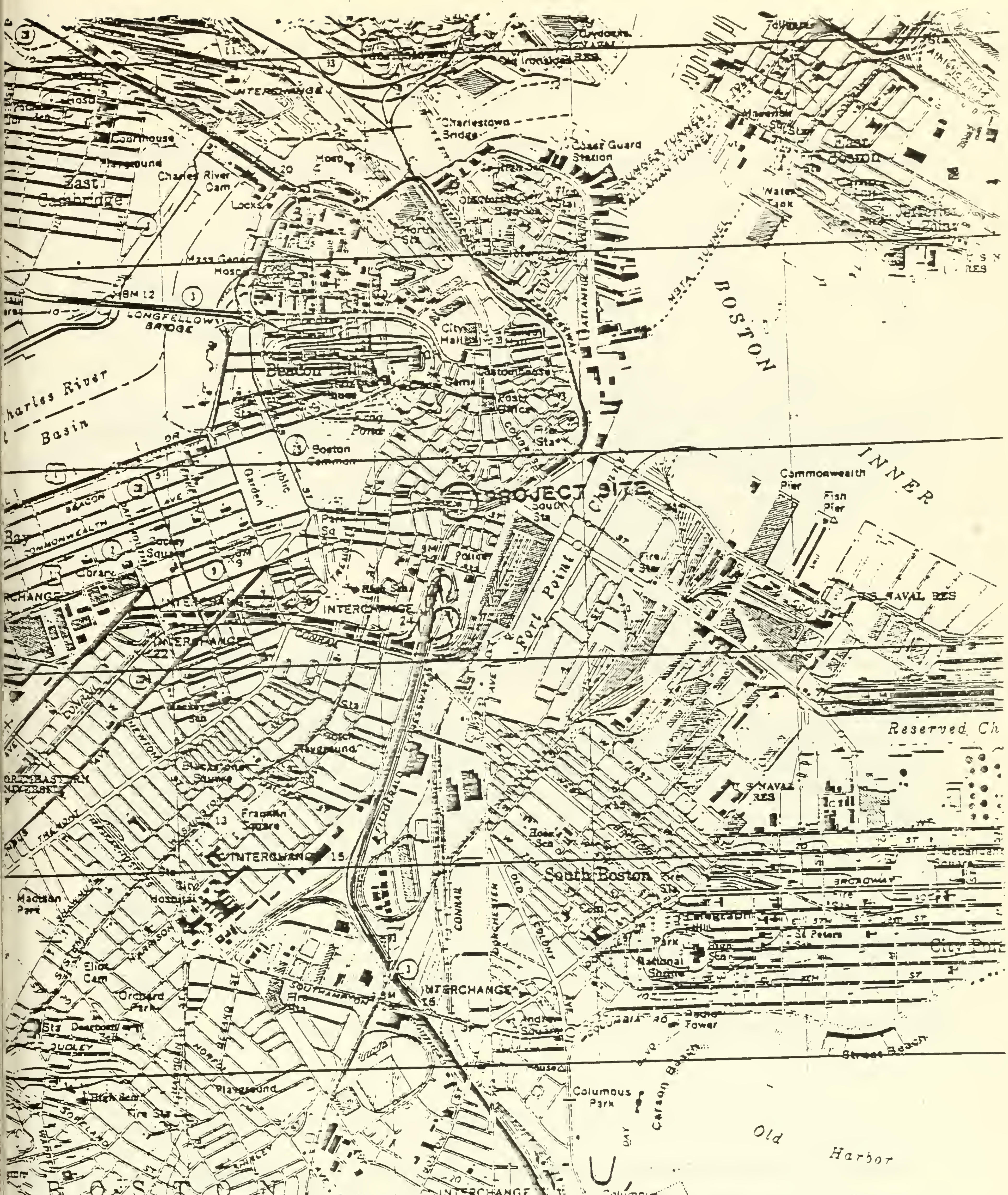
1. Developed .... 1.1 acres
2. Open Space/Woodlands/Recreation ____ acres
3. Wetlands .... ____ acres
4. Floodplain .... ____ acres
5. Coastal Area .... ____ acres
6. Productive Resources
   - Agriculture .... ____ acres
   - Forestry .... ____ acres
   - Mineral Products .... ____ acres

C. Provide the following dimensions, if applicable:
Length in miles NA Number of Housing Units NA Number of Stories 20-30

	Existing	Immediate Increase Due to Project
Number of Parking Spaces	813	0-37
Vehicle Trips to Project Site	1,626	0-74
Estimated Vehicle Trips past project site	21,000	800-1,300

D. If the proposed project will require any permit for access to local or state highways, please attach a sketch showing the location of the proposed driveway(s) in relation to the highway and to the general development plan; identifying all local and state highways abutting the development ; and indicating the number of lanes, pavement width, median strips and adjacent driveways on each abutting highway, and indicating the distance to the nearest intersection.

Location of curb cuts will be determined during schematic design phase of the proposed buildings.



KINGSTON-BEDFORD/ESSEX STREET DEVELOPMENT PARCELS

SCALE 1:25 000

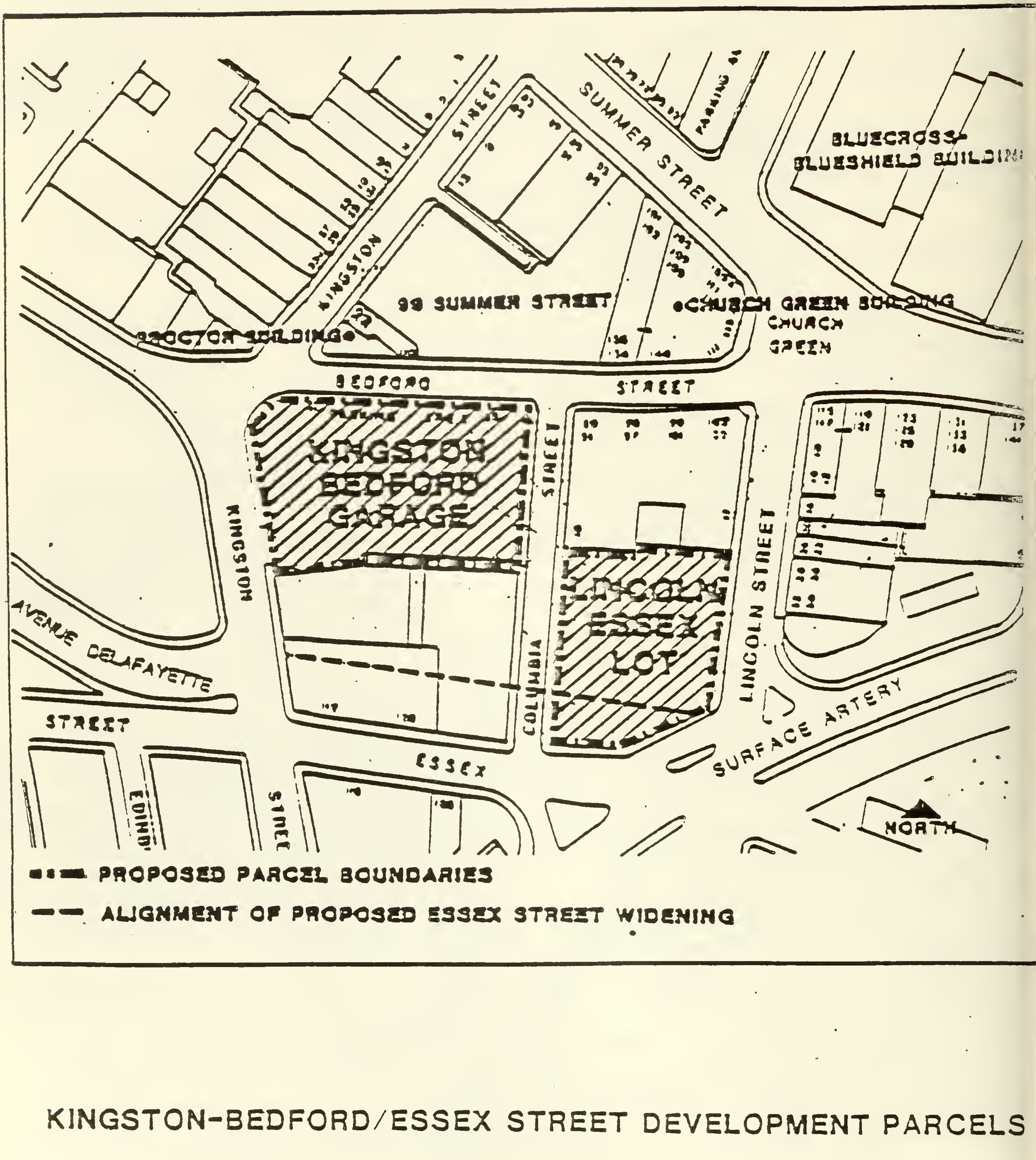
1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 KILOMETER

BOSTON SOUTH, MA
N4215—W7100/7.5

1970
PHOTOREVISED 1979



KINGSTON-BEDFORD/ESSEX STREET DEVELOPMENT PARCELS

ASSESSMENT OF POTENTIAL ADVERSE ENVIRONMENTAL IMPACTS

Instructions: Consider direct and indirect adverse impacts, including those arising from general construction and operations. For every answer explain why significant adverse impact is considered likely or unlikely to result.

Also, state the source of information or other basis for the answers supplied. If the source of the information, in part or in full, is not listed in the ENF, the preparing officer will be assumed to be the source of the information. Such environmental information should be acquired at least in part by field inspection.

A. Open Space and Recreation

1. Might the project affect the condition, use or access to any open space and/or recreation area?
Yes ______ No __X__

Explanation and Source:

No recreation or public open space uses currently exist on site. Covered pedestrianways and a possible landscaped public plaza formed by the closure of Columbia Street are planned to be incorporated into the proposed development. A variety of sidewalk and streetscape improvements, planned in conjunction with the Boston Redevelopment Authority, will be created adjacent to the sites, as will public lobbies, arcades, and atria within the two buildings. The project is expected to become an active, public area with appealing public spaces and some open space.

B. Historic Resources

1. Might any site or structure of historic significance be affected by the project? Yes __X__ No ______

Explanation and Source:

The project area is located adjacent to the historic Bedford Building at 83-103 Bedford Street and across the street from the Proctor Building (100 Bedford Street) and the Church Green and Commercial Palace historic districts. The Bedford Building is listed on the Massachusetts and National Registers of Historic Places and the Proctor and Church Green buildings are listed on the Massachusetts Registers.

Boston Landmarks Commission

2. Might any archaeological site be affected by the project? ~~Yes~~ __X__ ~~No~~ ______

Explanation and Source:

According to the City Archaeologist, there is a possibility that the two sites could contain archaeological resources. Therefore, an archaeological survey will be required prior to construction of the proposed project.

C. Ecological Effects

1. Might the project significantly affect fisheries or wildlife, especially any rare or endangered species?
Yes ______ No __X__

Explanation and Source:

The project sites are located within the midst of a developed urban area supporting no fisheries, wildlife (save the ubiquitous pigeon), or endangered species.

Massachusetts Natural Heritage Program

2. Might the project significantly affect vegetation, especially any rare or endangered species of plant?
Yes ______ No __X__
(Estimate approximate number of mature trees to be removed: ___0___)

Explanation and Source:

The project sites are developed urban parcels and are devoid of any vegetation.

3. Might the project alter or affect flood hazard areas, inland or coastal wetlands (e.g., estuaries, marshes, sa dunes and beaches, ponds, streams, rivers, fish runs, or shellfish beds)? Yes ______ No __X__

Explanation and Source:

The project sites are not located within a flood hazard area nor are they adjacent to any inland or coastal wetland.

Federal Emergency Management Agency Flood Insurance Rate Map (Panel #2502860010C, April 1982)

4. Might the project affect shoreline erosion or accretion at the project site, downstream or in nearby coas areas? Yes ______ No __X__

Explanation and Source:

The project sites are inland sites and are not located near any shoreline or coastal area.

5. Might the project involve other geologically unstable areas? Yes ______ No __X__

Explanation and Source:

The project sites are part of the original Boston peninsula. Available soil borings in the vicinity of the sites indicate subsurface soils consisting of fill material over strata of clay and sand and gravel (glacial till). Existing conditions would not be considered geologically unstable.

Boston Society of Civil Engineers soil data.

D. Hazardous Substances

1. Might the project involve the use, transportation, storage, release, or disposal of potentially hazardou substances?
Yes __X__ No ______

Explanation and Source:

The parking garage will entail the storage of automobiles containing gasoline. No other potentially hazardous substances are expected to be stored on-site.

E. Resource Conservation and Use

1. Might the project affect or eliminate land suitable for agricultural or forestry production?
   Yes ______ No X
   (Describe any present agricultural land use and farm units affected.)

   Explanation and Source:

   The project sites are located in the midst of a developed urban area and do not support any agricultural or forestry production.

2. Might the project directly affect the potential use or extraction of mineral or energy resources (e.g., oil, coal, sand & gravel, ores)? Yes ______ No X

   Explanation and Source:

   No mining activities occur in the vicinity of the project sites.

3. Might the operation of the project result in any increased consumption of energy? Yes X No ______

   Explanation and Source:
   (If applicable, describe plans for conserving energy resources.)

   The proposed project will result in increased energy consumption over the current uses. The proposed buildings will incorporate energy-efficient design standards and will meet the requirements of the Massachusetts Energy Code. Energy also will be consumed for the construction of the project.

F. Water Quality and Quantity

1. Might the project result in significant changes in drainage patterns? Yes ______ No X

   Explanation and Source:

   Because the site is fully developed and completely impervious, the proposed redevelopment is not expected to result in increased runoff or change in drainage patterns.

2. Might the project result in the introduction of pollutants into any of the following:

(a)	Marine Waters	Yes ______	No X
(b)	Surface Fresh Water Body	Yes ______	No X
(c)	Ground Water	Yes ______	No X

   Explain types and quantities of pollutants.

   The project will result in no direct discharge into marine or fresh water bodies. Sanitary sewage will be conveyed to the MDC treatment facility at Deer Island and ultimately discharged into Boston Harbor. Storm runoff will be conveyed via local sewers to the East Side Interceptor and thence to the Harbor. Due to system deficiencies, there are frequent occurences of wet-weather combined sewer overflows into the Harbor and Fort Point Channel. Reconstruction of the East Side Interceptor should significantly reduce the frequency of overflows.

3. Will the project generate sanitary sewage? Yes X No ____
If Yes. Quantity: * gallons per day
Disposal by: (a) Onsite septic systems .... Yes ____ No X
(b) Public sewerage systems .... Yes X No ____
(c) Other means (describe) ____

*33,500 - 67,000 gallons, depending on development option

Title 5, Massachusetts Environmental Code (Sewage Flow Estimates)

4. Might the project result in an increase in paved or impervious surfaces over an aquifer recognized as an important present or future source of water supply? Yes ____ No X

Explanation and Source:

The project is not located over an acquifer recognized as a present or future source of water supply.

5. Is the project in the watershed of any surface water body used as a drinking water supply?
Yes ____ No X
Are there any public or private drinking water wells within a 1/2-mile radius of the proposed project?
Yes ____ No X

Explanation and Source:

No public or private drinking wells are located in the City of Boston. The City's water is supplied by the MWRA/MDC from the Quabbin Reservoir in western Massachusetts.

6. Might the operation of the project result in any increased consumption of water? Yes X No ____
Approximate consumption * gallons per day. Likely water source(s) MWRA/MDC

Explanation and Source:

*38,525 - 77,050 gallons, depending on development option

Sanitary sewage +15%

7. Does the project involve any dredging? Yes ____ No X
If Yes, indicate:
Quantity of material to be dredged ____
Quality of material to be dredged ____
Proposed method of dredging ____
Proposed disposal sites ____
Proposed season of year for dredging ____

Explanation and Source:

The project site is not located on any shoreline.

G. Air Quality

1. Might the project affect the air quality in the project area or the immediately adjacent area?
   Yes X No ___
   Describe type and source of any pollution emission from the project site. TSP, CO, NO_x

   Short-term air quality effects will occur during construction, particularly dust emissions from building demolition, site preparation, and excavation and pollutan emissions from construction equipment. Wetting of the site can reduce dust emissi significantly. The additional vehicular traffic generated by the project will res in increases in auto-related pollutants in the project vicinity. The project will be monitored to ensure that impacts on the adjacent Chinatown community , one of Boston's most special community are minimized.

2. Are there any sensitive receptors (e.g., hospitals, schools, residential areas) which would be affected by any pollution emissions caused by the project, including construction dust? Yes X No ___

   Explanation and Source:

   Land uses in the vicinity of the project sites are largely comprised of offices ar commercial facilities. There is, however, heavy pedestrian traffic in the area, particularly along Summer Street, and a shelter for the homeless is located on Kingston Street near the garage parcel. In addition, the project sites are adjace to Chinatown, Land uses immediately adjoining the site are largely comprised of offices and commercial facilities. There is heavy pedestrian traffic in the immediate area. A shelter for the homeless is located on Kingston Street near*

3. Will access to the project area be primarily by automobile? Yes ___ No X (see over)

   Describe any special provisions now planned for pedestrian access, carpooling, buses and other mass transit.

   The majority of the trips to the project sites (75% or more) are expected to be made by modes other than automobile (subway, bus, walk, etc.) The sites are within easy walking distance of public transportation facilities at South Station and Washington Street and to commuter bus stops. In accordance with City policy, the redeveloper will be required to submit an Access Plan outlining measures to manage auto access to the project. The access plan will be reviewed with the Chinatown community.

H. Noise

1. Might the project result in the generation of noise? Yes X No ___

   Explanation and Source:
   (Include any source of noise during construction or operation, e.g., engine exhaust, pile driving, traffic.)

   Short-term noise effects will occur during the construction period. Noise attenuation measures will be required to reduce the noise impacts to the extent feasible. In the long-term, some increase in community noise levels could result from the increase in area traffic, although the increases may not be readily perceivable due to the high ambient levels in the downtown area. Special attention will be given to measures to mitigate adverse impacts of noise on Chinatown.

2. Are there any sensitive receptors (e.g., hospitals, schools, residential areas) which would be affected by any noise caused by the project? Yes X No ___

   Explanation and Source:

   Land uses in the vicinity of the project sites are largely comprised of office and commercial facilities. There is, however, heavy pedestrian traffic in the area, particularly along Summer Street, and a shelter for the homeless is located on Kingston Street near the garage parcel. In addition, the project sites are adjace to the Chinatown community, and there are residences on the upper floors of nearby buildings. Mitigation measures will be implemented during construction to minimiz noise impacts on these residential uses. Proposed measures will be reviewed by the community.

2. Explanation and Source (continued)

the garage parcel. The project is adjacent to Chinatown, one of the most unique residential communities in Boston. Special attention must be given to mitigate any adverse air quality impacts on this special community. Because there are a number of sources of air pollution in the vicinity of this neighborhood, mitigation measures to minimize air quality impacts, particularly during construction, should be carefully developed.

I. Solid Waste

1. Might the project generate solid waste? Yes X No ____

Explanation and Source:
(Estimate types and approximate amounts of waste materials generated, e.g., industrial, domestic, hospital, sewage sludge, construction debris from demolished structures.)

Construction of the project will result in the generation of debris associated with the demolition of the garage building on site, excavation for building foundations and subsurface parking, and the construction of the new buildings. The completed project will generate approximately 2.25 to 4.5 tons of solid waste daily, depending on the development options ultimately selected.

J. Aesthetics

1. Might the project cause a change in the visual character of the project area or its environs? Yes X No ____

Explanation and Source:

The project will replace an unattractive garage structure and an open parking lot with office buildings of a massing, scale, and treatment to complement that of neighboring buildings and the pattern of surrounding streets and blocks. In order to assure the appropriate design and siting of the project in relation to the Chinatown community, the project will be planned and developed with community participation and review. The Boston Civic Design Commission will review design proposals.

2. Are there any proposed structures which might be considered incompatible with existing adjacent structures in the vicinity in terms of size, physical proportion and scale, or significant differences in land use? Yes ____ No X

Explanation and Source:

The project will be developed in accordance with design guidelines and an extensiv review process established by the Boston Redevelopment Authority with input by the Boston Civic Design Commission. Design guidelines will ensure that the massing of the new buildings will reflect the proportions and dimensions of the historic and characteristic buildings in the surrounding area, particularly those in Chinatown, as well as relate to and strengthen the city skyline. As noted, the Chinatown community will have input and review to assure appropriate design.

3. Might the project impair visual access to waterfront or other scenic areas? Yes ____ No X

Explanation and Source:

The project is not located near any waterfront area or any scenic area. A structural setback from the Kingston-Bedford corner will be required to preserve the view of the historic Proctor Building from Kingston Street.

K. Wind and Shadow

1. Might the project cause wind and shadow impacts on adjacent properties? Yes X No ____

Explanation and Source:

If high rise buildings are developed on the site, wind and shadow impacts on the surrounding area could result, but the project will be desinged to minimize these effects. Wind-tunnel analyses and shadow studies will be included in the Draft Environmental Impact Report. Special attention must be given to mitigate any negative noise impacts on the Chinatown community.

IV. CONSISTENCY WITH PRESENT PLANNING

A. Describe any known conflicts or inconsistencies with current federal, state and local land use, transportation, open space, recreation and environmental plans and policies. Consult with local or regional planning authorities where appropriate.

The project is the first project of the Parcel-to-Parcel Linkage Program, underwhich the City and Commonwealth have undertaken to utilize publically controlled land in downtown and neighborhood locations to direct Boston's economic prosperity to its neighborhoods. It is the objective of this program that these parcels contribute to the building of the neighborhood economy through:

- creation of equity for minority developers and community development corporations (Continued on back page)

V. FINDINGS AND CERTIFICATION

A. The notice of intent to file this form has been/will be published in the following newspaper(s) :

(Name)	(Date)
Boston Herald	June 27, 1986
Sam Pan	July 2, 1986

B. This form has been circulated to all agencies and persons as required by Appendix B.

June 30, 1986
Date

Signature of Responsible Officer or Project Proponent

Stephen Coyle, Director
Name (print or type)

Address Boston Redevelopment Authority
Boston City Hall
Boston, MA 02201

Telephone Number 722-4300

June 30, 1986
Date

Signature of person preparing ENF (if different from above)

Richard B. Mertens or Ivy Dilworth
Name (print or type)

Address Boston Redevelopment Authority
Boston City Hall
Boston, MA 02201

Telephone Number 722-4300 X323
722-4300

IV. Consistency with Present Planning (Continued)

- provision of opportunities for Minority Business Enterprises
- funding of community development activity
- increased employment of City residents
- creating appropriate urban design for the projects
- extensive community review and participation

APPENDIX A-2

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
Department of Environmental Quality Engineering
Division of Air Quality Control
One Winter Street, Boston 02108

S. RUSSELL SYLVA
Commissioner

MEMORANDUM

RECEIVED
JUL 31 1986
OFFICE OF THE SECRETARY OF
ENVIRONMENTAL AFFAIRS

TO: Executive Office of Environmental Affairs

ATTN: Nancy Baker, MEPA Unit

FROM: Michael Scherer, MJ Division of Air Quality Control

DATE: July 24, 1986

SUBJECT: EOEA No. 6132 - Kingston - Bedford/Essex St. Development, Boston; Review of Environmental Notification Form (ENF)

The Department of Environmental Quality Engineering (DEQE) has received and reviewed the ENF for the above referenced project submitted by the Boston Redevelopment Authority. The project development will consist of one of three massing options of a not yet specified mix of office, retail, hotel and residential development. The development will be contained in either one or two buildings with a combined total gross footage not to exceed 900,000 s.f. Based upon a review by staff from the Division of Air Quality Control, DEQE offers the following comments:

1. The project is categorically included under 301 CMR 10.32 for several categories including traffic, thereby requiring the preparation of an environmental impact report (EIR). Due to the sensitivity of the project area, the magnitude of the project itself, and for the aforementioned reasons, DEQE recommends that the EIR include an air quality analysis. The proponent should consult with DEQE in order to identify actual receptors as well as inputs to be used in the Mobile-3 and Caline-3 models.

2. DEQE recognizes the City of Boston's policy in requiring a detailed project Access Plan. In addition, the proponent must include in the EIR, a traffic analysis incorporating all necessary roadway and intersection improvements.

2. (Cont.)

All project-affected roadways and intersections degraded to a Level-of-Service(LOS) D inclusive, or worse must be addressed. Of particular concern are the access/egress points of the proposed parking facility and the following intersections:

- o Essex/Kingston
- o Essex/Columbia
- o Summer/Lincoln/Bedford
- o Washington/Essex
- o Essex/Harrison Ave. Ext./Chauncy -(Phillips Square)
- o Essex/Surface Artery
- o High/Summer
- o Otis/Kingston/Summer

Essex Street is reputed for exceptionally poor LOS and is officially recognized in the State Implementation Plan (SIP) as a Carbon Monoxide Hotspot. This designation was made through previous DEQE approved monitoring and modeling of the area which detected violations of the National Ambient Air Quality Standards for Carbon Monoxide (two exceedances in one year equal one violation). For this reason DEQE is especially cautious about future Essex St. development and strongly recommends substantially effective mitigating measures. The recommended Traffic Analysis needs to contain a detailed description of the proposed Essex St. Widening.

3. DEQE expects the proponent to include in the Access Plan; Reasonable Available Control Measures (RACM's) such as car-pooling, vanpooling, public transit-use incentives and flexible work schedules to reduce peak hour demands. RACM's such as these are an integral part of the SIP and are designed to reduce Ozone and Carbon Monoxide.

4. The proponent should suggest measures to alleviate dust and noise nuisance conditions which may occur during and after construction. Such measures must comply with DEQE regulations 310 CMR 7.09 and 7.10. This is particularly important due to the fact that the proponent intends to demolish existing structures. Also, in accordance with 310 CMR 7.15, the DEQE Northeast Office in Woburn must be notified twenty days in writing, prior to initiation of any on-site asbestos removal operation.

5. The proponent must submit formal plans to the Department for approval for any fossil fuel burning facility with a capacity greater than 3 mm BTU or any incinerator proposed for this development subject to DEQE regulation 310 CMR 7.02. Such approval must be granted prior to the construction of the facility.

If you have any question regarding this memorandum, please contact Jerome Grafe of the Division of Air Quality Control at 292-5708.

JG/ch

cc: Mike Maher, DEQE Northeast Region
Donald Squires, DAQC
Richard Mertens, BRA

The Commonwealth of Massachusetts

Executive Office of Transportation and Construction

Department of Public Works

Ten Park Plaza, Boston 02116-3973

September 9, 1986

Boston Redevelopment Authority
Boston City Hall
Boston, MA 02201

Attention Mr. Richard B. Mertens

Subject: Kingston-Bedford/Essex Street Development
ENF Dated June 30, 1986

Dear Mr. Mertens:

This letter is to provide comments on the subject project on behalf of the Massachusetts Department of Public Works/Central Artery Project.

In reviewing the subject ENF, we note that the Lincoln Essex parcel abuts the existing Dewey Square Tunnel wall on the southeast. The proposed development is also in proximity to an existing tunnel ventilation structure on the adjoining block to the east, and Central Artery ramps serving nearby intersections. The Lincoln Essex parcel appears to conflict with the proposed widening of Essex Street.

We request that the draft EIR address impacts to Central Artery facilities, particularly with regard to:

- Traffic increases on the Central Artery and ramps.
- Air quality in the vicinity of tunnel ventilators.
- Coordination of construction traffic and activities with those of the Central Artery and other proposed construction in the vicinity.
- Physical/structural impacts on the Central Artery tunnel.

We request that BRA and its selected developer(s) coordinate with MDPW during development of the EIR and project plans.

A copy of this letter is provided to EOEA/MEPA Unit, with the request that the above issues be noted and incorporated into the DEIR scope as appropriate.

Sincerely,

Mario H. Tocci
DIRECTOR I-90/I-93 PROJECT

The Commonwealth of Massachusetts
Office of the Secretary of State
Michael Joseph Connolly, Secretary

Massachusetts Historical Commission
Valerie A. Talmage
Executive Director
State Historic Preservation Officer

RECEIVED
JUL 28 1986
OFFICE OF THE SECRETARY OF ENVIRONMENTAL AFFAIRS

July 25, 1986

Secretary James S. Hoyte
Executive Office of Environmental Affairs
100 Cambridge Street
Boston, MA 02202

ATTENTION: MEPA Unit

RE: Kingston-Bedford/Essex St. Development, Boston

Dear Secretary Hoyte:

Staff of the Massachusetts Historical Commission have reviewed the Environmental Notification Form for the proposed project listed above.

Since the projects will be funded through a Community Development Action Grant and Urban Development Action Grant, and since the BRA will be involved in a land disposition agreement and thus act as a state agency, the MHC would like to remind the project proponents that the effects of the proposed Kingston-Bedford/Essex Street Development on significant historic and archaeological properties must be reviewed in compliance with Section 106 of the National Historic Preservation Act (36 CFR800), M.G.L. Ch. 9, SS. 26-27C (950 CMR71) and MEPA.

The proposed development parcel is adjacent to the Church Green and Bedford Building, properties listed in the State and National Register of Historic Places. It is also adjacent to the Commercial Palace District, which has been determined eligible for listing in the National Register, and is included in the State Register of Historic Places.

Review of the project's massing options presented in the ENF indicates that some of the project alternatives are likely to have adverse effects upon the setting of the historic properties which are adjacent to the project parcels. New construction which has recently been planned or undertaken in the area adjacent to the Commercial Palace district have isolated historic properties from their surrounding environments. High rise construction on the Kingston-Bedford and Essex Street development parcels would isolate the setting of the Bedford Building, Church Green and Commercial Palace district.

The project parcels are located on the waterfront edge of the historic Shawmut Peninsula, which was the original land surface of Colonial Boston. Thus, the project areas are likely to contain historic archaeological remains associated with the earliest European settlement of Boston. Prehistoric Indian occupation sites may also be present.

MHC requests that the scope of the project's EIR include a discussion of the effects of the proposal on the adjacent historic properties. Alternative scenarios which would avoid or minimize effects to the Commercial Palace District, Bedford Building and Church Green should be carefully and thoughtfully explored and presented in the EIR. MHC also requests that an archaeological reconnaissance be conducted, the results of which should be presented in the EIR. The reconnaissance should include a background study of the historic development of the parcels and an assessment of subsurface conditions, in order to determine whether significant archaeological properties will be affected by the proposal.

Project applicants will probably find it most convenient to conduct the required State Register of Historic Places and National Historic Preservation Act reviews in coordination with MEPA. Project proponents should contact the MHC staff to initiate these historic reviews, in order to undertake a timely, efficient and productive review process.

If you have any questions concerning these comments, please contact Brona Simon or Maureen Cavanaugh at this office.

Sincerely,

Valerie Talmage

Valerie A. Talmage
Executive Director
State Historic Preservation Officer
Massachusetts Historical Commission

VT/sac

xc: ACHP
EOCD
Judy McDonough, Boston Landmarks Commission
HUD
Stephen Coyle, Boston Redevelopment Authority
Susan Park, Boston Preservation Alliance

The Commonwealth of Massachusetts

Aeronautics Commission

10 Park Plaza, Room 6620

Boston, Massachusetts 02116-3966

(617) 973-7350

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William LaMont Thompson

DIRECTOR OF AERONAUTICS

Arnold R. Stymest

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JUL 11 1986

OFFICE OF THE SECRETARY OF ENVIRONMENTAL AFFAIRS

July 10, 1986

James S. Hoyte, Secretary
Executive Office of Environmental Affairs
100 Cambridge Street, #2000
Boston, MA 02202

Attn: MEPA Unit

Re: EOEA #6132, Boston

Dear Secretary Hoyte:

This agency has reviewed the two development proposals between Bedford St. and Surface Artery for potential impacts on the flight paths of helicopters through this area. We have identified two issues which we suggest the Environmental Impact Report on these projects consider.

First, the established route for traffic reporting helicopters passes over this area at 500 feet above mean sea level, which is not sufficient clearance above the maximum height proposed at the Kingston-Bedford site.

Second, we need to ensure coordination with the jointly sponsored heliport site selection project for this area, in which the BRA is a participant.

Sincerely,

Arnold R. Stymest

Arnold R. Stymest
Executive Secretary

RK:ek

xc: B. Rakoff, E&K
L. Fabian, BRA
M. A. Jan, FAA (ANE-610)
NEHPA

MAPC

Metropolitan Area Planning Council

110 Tremont Street Boston, Massachusetts 02108 (617)-451-2770

Serving 101 Cities & Towns in Metropolitan Boston

July 24, 1986

RECEIVED
JUL 30 1986
OFFICE OF THE SECRETARY OF ENVIRONMENTAL AFFAIRS

The Honorable James S. Hoyte, Secretary
Executive Office of Environmental Affairs
MEPA Unit
100 Cambridge Street
Boston, MA 02202

Project Identification

Project Name: Kingston-Bedford/Essex St. Development — EOEA#: 6132

Project Proponent: Boston Redevelopment Authority — MAPC#: ENF-86-163

Location: Boston — Received: July 3, 1986

Dear Secretary Hoyte:

In accordance with the provisions of Chapter 30, Section 62, of the Massachusetts General Laws, the Council has reviewed the Environmental Notification Form identifie above and offers the following comments:

1. ____ Environmental Notification Form adequate; no Environmental Impact Report should be required.

2. ____ Before a determination can be made as to whether or not an Environmental Impact Report should be required, additional information should be provided on ( ) probable environmental impacts, ( ) alternatives to proposed action, and/or ( ) measures proposed to mitigate probable impacts.

3. _X_ An Environmental Impact Report ( ) should be required, (x) is categorically required.

4. _X_ Additional comments are attached.

Sincerely,

Joel B. Bard

Joel B. Bard
Acting Executive Director

JBB/DF/mlm
cc: Richard Dimino, MAPC Rep., Boston
Richard Mertens, BRA
Marc Webb, BRA
Daniel Fortier, MAPC

Additional Comments

The proposed Kingston-Bedford/Essex Street Development will replace 813 public parking spaces with an equal number of private spaces. The environmental impact report should cover traffic and air quality impacts of the users of the existing parking facilities as well as Transportation Systems Management strategies to minimize such an impact.

Boston

Raymond L. Flynn, Mayor

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OFFICE OF THE SECRETARY OF ENVIRONMENTAL AFFAIRS

July 22, 1986

Secretary James S. Hoyte
Executive Office of Environmental Affairs
Attn: MEPA Unit
100 Cambridge St.
Boston, MA 02202

Dear Secretary Hoyte;

The Department of Transportation is in receipt of the Environmental Notification Form for the Kingston-Bedford/Essex St. Development proposed by the Boston Redevelopment Authority. Our concerns are summarized here. The following items should be addressed in the Draft Environmental Impact Report (DEIR).

The project will generate traffic which will affect many intersections in the immediate area. At a minimum, we would like to see these intersections analyzed in terms of existing and future turning movement volumes and levels of service:

Bedford/Kingston
Bedford/Columbia
Bedford/Lincoln
Bedford/Chauncy
Essex/Harrison
Essex/Kingston
Surface Artery/Essex/Lincoln
Summer/Lincoln/Bedford
Summer/High
Harrison/Beach

There are a number of major planning and development initiatives underway in the area which the developers should take into account in preparing the DEIR. These include the Dewey Square Transportation System Management Plan, the proposed development of Lafayette Place II and related evaluation of design alternatives for the creation of a westbound arterial to Tremont St. using the Essex St. corridor, the widening of Essex St., the 125 Summer St. development, and the Central Artery/Third Harbor Tunnel project. Boston Transportation Department staff are available for consultation in selecting scenarios of potential background development.

Richard A. Dimino, Commissioner, Traffic and Parking
City of Boston/City Hall Square/Boston, MA 02201

Parking will also be an issue. The proposed development replaces a 750-car garage and a 78-car parking lot. The ENF, in stating that "public parking for an estimated 600-850 cars would be provided on the sites," is unclear as to how competing demand for parking by users of the new buildings and by the users of existing public parking would be reconciled. This question must be clearly addressed in the DEIR.

In addition to examining the capacity of the street system and parking supply, we would like to see a careful and realistic analysis of the capacity of the public transportation system to handle the added patronage which this project would generate. Such an analysis should begin by showing the relation of capacity to volume on the system (specifically, the Red Line, Green Line, Orange Line and bus services) under present conditions.

Thank you for the opportunity to comment on this project. We look forward to reviewing the DEIR when it is ready.

Sincerely,

Richard A. Dimino

City of Boston
The Environment
Department

Boston City Hall/Room 805
Boston, Massachusetts 02201
617/725-4416 or 725-3850

August 11, 1986

RECEIVED
AUG 20 1986
OFFICE OF THE SECRETARY OF
ENVIRONMENTAL AFFAIRS

James Hoyte, Secretary
Executive Office of Environmental Affairs
20th Floor
100 Cambridge Street
Boston, MA. 02202

ATTN: MEPA Unit, Nancy Baker - EOEA #6132 - Kingston-Bedford/Essex Street.

Dear Secretary Hoyte:

The City of Boston Environment Department has received the Environmental Notification Form for the project entitled "Kingston - Bedford/Essex Street" and would like to submit the following comments, albeit late, for the record:

1. This area is currently devoid of large landscaped public space. What types of public open space are being provided to complement the nearby residential community and to provide a "connection" or "transition" between the buildings and the area around the buildings?

2. In connection with the proposed public space, there is the opportunity for the creation of public art which could be integrated in a variety of ways into the landscape. We would like to see this opportunity explored.

3. It is required under the Boston Parking Freeze Criteria that the type of parking facility planned is enunciated. The City is concerned with the proposed fee structure, and the encouragement of short-term parking availability.

4. Control of fugitive dust from building demolition is especially important. There have been problems at other demolition sites around the city with "clouds" of particulates blowing one to two blocks from the site.

5. Another aspect of demolition and construction that the city is concerned about is the minimization of the adverse effects of construction noise on the local community. The hours of 7a.m. to 6p.m. for construction activity as mandated by the Boston Noise Ordinance should be strictly adhered to.

6. The ENF needs minor technical corrections in Section III, 3.1. The Bedford Building is listed individually in the National Register and Massachusetts Register, and the entire Commercial Palace District has been determined eligible for listing in the National Register. The Proctor and Church Green Buildings are designated as Boston Landmarks. On the other side of Essex Street lies the Essex Textile District which has been identified as meriting NR listing, and the Leather District lies to the south-east of the proposed project is listed. The ENF does not discuss these latter elements.

- Building heights in the 250 to 400 feet range will not reflect the proportions and dimensions of the surrounding area, particularly those in Chinatown. Many of the Chinatown structures are in the three to six story category and will be dwarfed by the project. There is incompatibility in size, physical proportion and scale reflected in the taller height options. Different alternatives should be looked at.

- This project identifies the need for an archeological survey. The full EIR for this project should address this issue.

Sincerely,

Lorraine M Downey

Lorraine M. Downey
Executive Director

Dick Mantro

RECEIVED
JUL 22 1986
Ans'd............

BOSTONIA CONDITA A.D. 1630. SICUT PATRIBUS SIT DEUS NOBIS. CIVITATIS REGIMINE DONATA A.D. 1822

Boston
Landmarks
Commission

City of Boston
The Environment
Department

Boston City Hall Room 805
Boston, Massachusetts 02201
617 725-3850

July 17, 1986

Mr. Stephen Coyle
Boston Redevelopment Authority
Boston City Hall
Boston, MA 02201

ATTN: Ricardo Millett

Dear Mr. Coyle:

Thank you for the request to comment on the ENF for the Kingston-Bedford Essex St. development project and the Parcel 18 complex in Roxbury. The project goals are lauditory. The BLC staff comments concern the potential impacts on historic resources.

Kingston-Bedford Essex Project

A.
The ENF needs minor technical corrections in Section III, B.1. The Bedford Building is listed individually in the National Register and Massachusetts Register, and the entire Commercial Palace District has been determined eligible for listing in the National Register. The Proctor and Church Green Buildings are designated as Boston Landmarks. On the other side of Essex Street lies the Essex Textile District which has been identified as meriting NR listing, and the Leather District lies to the south-east of the proposed project is listed. The ENF does not discuss these latter elements.

B.
The ENF in J. 1 & 2 Aesthetics presents contradictory and obfuscatory statements. A straightforward presentation is expected here. The current downtown planning documents encourages a high rise zone along this corridor. Building heights in the ~~maximum~~ 250 feet to 400 feet range cannot have "massing [that] will reflect the proportions and dimensions of hee surrounding area, particularly those in Chinatown." Many of the Chinatown structures are in the 3 to 6 story category and will be be dwarfed by the project. By any definition the question in III J. 2. must be answered yes, as there is incompatibility of size, physical proportion, and scale.

The impact of this project on historic resources may be mitigated by the general downward revision of height limits in the rest of the downtown. A full EIR will explore this. This ENF amended in these areas present factual material, not vague, urban design jargon.

Parcel 18, Roxbury

The project is stated accurately but not completely in Section III B. 1. The Roxbury Preservation Survey of 1980 identified the Ruggles St. Baptist Church, 159 Ruggles St. and Whittier St. Health Center as meriting further study for preservation action. The study will be reevaluated in the fall to examine recommendations.

In Section J. 1 & 2, the impacts as projected are stated factually without obfuscation. In J. 3., the scenic vista towards Roxbury Highfort or Roxbury Standpipe (N.R.) is not identified. This victorian water pipe has a prominent place on the Roxbury skyline. Measures should be determined in the full EIR to preserve its singularity on the skyline and the vistas towards it from major and more pedestrian thoroughfares.

Archaeology

Both projects identify the need for archaeological survey. The full EIR's for both projects should identify the extent of survey projected.

Sincerely,

Judith B. McDonough

Judith B. McDonough
Executive Director
Boston Landmarks Commission
Environment Department

cc: L. M. Downey
V. Talmage, MHC

doc. 3090E

BOSTON PRESERVATION ALLIANCE

July 31, 1986

RECEIVED
JUL 3 1986
OFFICE OF THE SECRETARY OF
ENVIRONMENTAL AFFAIRS

Secretary James S. Hoyte
Executive Office of Environmental Affairs
100 Cambridge Street
Boston, MA 02202

Attention: MEPA Unit
Re: Kingston-Bedford/Essex St. Development

Dear Secretary Hoyte:

The Boston Preservation Alliance would like to comment on the scope of the MEPA review for the parcel referred to as "Kingston-Bedford/Essex St."

Due to the parcel's proximity to a number of historic properties including the Bedford Building, Church Green, the Proctor Building and the Commercial Palace District, a careful and thorough assessment of the project's impacts on the historic fabric is required. The Section 106 Review conducted by the Massachusetts Historical Commission should provide the information necessary to develop sound guidelines for new development on the site.

In addition, an archeological survey should be conducted to determine if archeological data is available on the site and, if so, a future coarse of action. As you are aware, the site is located on the original land configuration of Boston, known as the Shawmut Peninsula.

Due to the complexity of the site, and the need to respond to the historical, community and environmental concerns, careful evaluations are warranted to insure sensitive contextural design and urban planning.

If you have any questions, please contact our office at 367-2458.

Sincerely,

Susan Park

Susan Park
Chairman

Old City Hall, 45 School Street, Boston, Massachusetts 02108 Telephone 617 367-2458

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
100 Cambridge Street
Boston, Massachusetts 02202

MICHAEL S. DUKAKIS
GOVERNOR

JAMES S. HOYTE
SECRETARY

CERTIFICATE OF THE SECRETARY OF ENVIRONMENTAL AFFAIRS

ON THE

ENVIRONMENTAL NOTIFICATION FORM

PROJECT NAME	: Bedford Kingston/Essex Development
PROJECT LOCATION	: Boston
EOEA NUMBER	: 6132
PROJECT PROPONENT	: Boston Redevelopment Authority
DATE NOTICED IN MONITOR	: July 9, 1986

Pursuant to the Massachusetts Environmental Policy Act (G.L.,c.30,s.62-62H) and Sections 10.04(1) and 10.04(9) of the regulations implementing MEPA (301 CMR 10.00), I hereby determine that the above project requires the preparation of an Environmental Impact Report.

The Kingston-Bedford Essex Street project poses an exciting challenge to the neighborhoods and the City of Boston. For the first time, tangible economic benefits from a major downtown project will be returned directly to the community affected. However, the magnitude of the project and expected economic gain must be skillfully balanced against an existing urban backdrop that is culturally and historically unique. This open, public review process should help foster the kind of dialogue necessary to achieve such a critical balance. Public hearings are encouraged throughout the EIR process.

The Kingston-Bedford/Essex Street mixed use project is of a magnitude that an environmental impact report is required, as per 301 CMR 10.32(5)(a). The draft EIR will evaluate the environmental affects of a range of alternatives. As such it will serve as a planning document from which a specific development proposal will evolve. The final EIR will be expected

to analyze the impacts of a developed project plan in greater detail. Based on the scoping session, the following issues should be covered in the EIR: traffic, parking, historical, archaeology, open space, alternatives, sewerage, utilities, wind, shadow, construction, air quality, growth, community/housing and the built environment.

As an aside, it should be noted that this office reviewed a proposal three years ago, which included the relocation of the Pagoda Park in the area of the Kingston-Bedford/Essex Street site. While the status of this park was unclear at the time of this scoping, it is the opinion of this office that the proposed project could have significant impacts on that park, and they have been identified throughout the scope. Further, since the park itself is in the spirit of what the City is trying to achieve in terms of their linkage program, it is hoped that the park relocation can move forward now at a pace that will mutually benefit both projects.

S C O P E

The EIR shall follow the organization set forth in the MEPA regulations, and include a copy of this scope. It should be guided by public and agency comments on the ENF and it should reflect the specific concerns raised in the following certificate.

Alternatives

The BRA has identified three preliminary alternatives that vary the height and massing for the mixed use development:

1. 250 foot height and 450,000 square feet,
2. 325 foot height and 575,000 square feet,
3. 400 foot height and 700,000 square feet.

A fourth alternative, which calls for more site coverage but lower heights was suggested at the scoping session. Whereas such an alternative may be more in character with the historic district and the Chinatown neighborhood, it would be useful to evaluate and compare this option with the three alternatives identified by the City. In any case, the environmental impact assessments of the alternatives should be compared with the No Build alternative.

Even though the draft EIR will be based on conceptual plans, the report must be rigorous in its analysis of the impacts relating to the alternatives. The report should be clear in its assessments of the detriments and benefits to the environment. Other economic advantages and disadvantages should also be noted.

Essex Street Widening

The option of widening Essex Street has been suggested as an alternative in the ENF and elsewhere. It should be evaluated, wherever relevant within the text of the EIR.

Open Space

The ENF has stated that the project will provide public areas and open space in the form of public plazas, lobbies, arcades and streetscape improvements.

The EIR should assess the area's needs with respect to urban open space and demonstrate how alternative development design concepts can satisfy those needs. To approach the open space issue the report should consider what people are presently doing, day to day, in the area to infer how the new open space areas could be utilized.

The alternative and proposed open space and urban design concepts for the project should be described and evaluated in terms of "openness" and the quality of the human experience available in those public areas. The report should clearly show that the design will be inviting to the public and particularly the neighboring areas. There should also be an explanation of the range of potential public activities and the freedom with which the public can choose among those activities.

The approach leading to the public areas and the access points will be key factors in linking the community to the public areas. Therefore, urban access design and its relationship to offsite public areas, such as the relocated Pagoda Park should also be thoughtfully investigated in the EIR.

Traffic Impacts

The traffic study area should encompass the key roadways and intersections within the Kneeland Street, Washington Street, Summer Street and Central Artery Corridor. Daily traffic counts,

taken for a minimum of four consecutive days and turning movement counts should be made for roadways and intersections within the study area, including but not limited to the following intersections which were identified in the Boston Traffic and Parking comment:

- o Bedford/Kingston
- o Bedford/Columbia
- o Bedford/Lincoln
- o Bedford/Chauncy
- o Essex/Harrison
- o Essex/Kingston
- o Surface Artery/Essex/Lincoln
- o Summer/Lincoln/Bedford
- o Summer/High
- o Harrison/Beach.

Growth trends and estimates of future area growth should be presented in the EIR. Project specific growth in the area should be identified and factored into the future growth, including the following: Lafayette Place II, 99 and 125 Summer Street, 101 Arch Street, and the Dewey Square Transportation System Management Plan.

The potential traffic generation from the mixed use development alternatives should be calculated for daily, weekday AM and PM peaks and Saturday afternoon traffic. The directional split of traffic to and from the site should be explained and diagrammed.

The intersections and roadways should be assessed in terms of traffic levels of service and volume capacity ratios for no build and all other build alternatives. This analysis should also include the proposed parking garage driveway(s).

The potential effects of proposed roadway improvement projects within the area should be explained and considered in the traffic impact analysis. Those roadway projects include: the potential widening of Essex Street, a possible westbound artery to Tremont Street using the Essex Street Corridor, the Central Artery depression and the Third Harbor Tunnel.

Intersection problems and significant increases in local street traffic attributable to the Kingston-Bedford/Essex Street project should be identified in the report.

The traffic mitigation section of the report should consider mass transit options as well as operation and design measures to reduce traffic impacts. This section should evaluate existing subway, commuter rail and bus service to the area. The capacity of the public transportation system should be estimated. Background growth and the project generated ridership should be determined for the range of alternatives. The EIR should analyze whether there will be adequate capacity in the transit system to handle the ridership increases predicted.

Parking

The proposed development will displace available public parking. It is not clear how the short term loss of parking during construction will be absorbed, nor is it clear the the parking provided by the project will ultimately replace the existing public parking, in addition to meeting the parking demands created by the project itself.

The EIR should explore the parking issue fully. Existing parking on site should be quantified, the shortfall during construction should be explained, and the displaced users should generally be identified. Parking alternatives during the interim period should be discussed.

The public and private parking demand created by the project should be estimated. Will the proposed garage have the capacity available to accommodate the existing public parking demand in addition to the project generated demand? If not, the report should evaluate off-site parking availability and management strategies to ease demand.

Air Quality

The State Implementation Plan (SIP) recognizes the Essex Street area as a Carbon Monoxide Hotspot, having detected violations of the National Ambient Air Quality Standards for CO. Therefore, it is essential that the proposed development contribute to the improvement of the air quality and not to its deterioration.

The air quality analysis should coincide with the traffic analysis in terms of analysis years and development alternatives. The analysis should include all intersections and roadways in the project affected area where the level of service has deteriorated to D and the project causes a 10 percent traffic increase or

where the final LOS E/F and the project contributes to the reduction in LOS. It should examine, but not be limited to the following:

- o parking garage
- o Essex/Kingston
- o Essex/Columbia
- o Summer/Lincoln/Bedford
- o Washington/Essex
- o Essex/Harrison Ave.Ext./Chauncy
- o Essex/Surface Artery
- o High/Summer
- o Otis/Kingston/Summer.

The air quality dispersion models to be used are Mobile-3 and Caline-3. The DEQE must be consulted to determine the applicable model parameters and to identify sensitive receptors. The analysis should be based on worst case traffic conditions and should present 1-hour and 8-hour CO concentration levels.

Given that CO exceedances of state and federal standards are expected, the EIR should present a complete mitigation program and show the effectiveness of that program in reducing air impacts.

Historic Impacts

The draft and final EIR will be expected to present quite different levels of analysis with respect to the potential effects of the project on the area's historic properties.

The DEIR should explain the applicable State and Federal review, the design guidelines for this site which were established in conjunction with a program for redevelopment of the Commercial Palace District, and any other applicable historic policies or plans for this area.

The draft should evaluate the massing and height alternatives proposed to show how the new development options could be compatible with and reinforce the character of the historic district, particularly the Proctor Building, the Bedford Building and the Church Green Building. It should also be demonstrated that building massing and scale can preserve the integrity of significant public spaces, such as the Church Green area and relocated Pagoda Park.

The final EIR should build on the historic assessment in the draft, refining the analysis as building masses and design elements crystallize. It should be demonstrated that the site development can respect the urban design characteristics and traditional architecture of the historic district in its use of materials, scale and building design. If the development is in contrast with the historic surroundings, consideration should be given to the effects on the district. The report should also present a thoughtful discussion of the treatment of the perimeter "edges" of the site in relation to the historic district.

Archaeology

The Massachusetts Historical Commission comment has requested that an archaeological reconnaissance survey be conducted and reported on in the EIR. Such a study is warranted based upon the site location which was part of the colonial waterfront, known as the Shawmut Peninsula.

The MHC has recommended that, "The reconnaisance should include a background study of the historic development of the parcels and an assessment of subsurface conditions, in order to determine whether significant archaeological properties will be affected by the proposal." The MHC should be consulted for assistance with determing the parameters of the archaeological survey. Further, in the event significant resources are identified, the EIR should explain the proposed mitigation strategy.

Sewerage

The EIR should describe the existing sewerage system between the project site and the wastewater treatment plant. Identify and explain any capacity shortfalls within that system for average daily and peak sewerage flows. Any CSO overflow problems should be discussed and the frequency of these events explained.

Average and peak increases in background sewerage flows should be estimated, based on known projects proposed for development during the same timeframe as the Kingston-Bedford/Essex project and within the same infrastructure service area.

The EIR should estimate the average daily and peak sewerage flows generated by the project. Further, the report should analyze the adequacy of the system to handle the increase

background sewerage flows plus the flows from the Kingston-Bedford/Essex project.

As deemed necessary, the report should identify remedial measures to improve the sewerage system. This report should be clear as to whether the City or the developer would be responsible for implementing those improvements and when those measures would be completed in relation to the project build out.

Utility Impacts

This section of the report should consider the adequacy of the existing water supply and power supply to meet the needs of the proposed development and other projects within the area that will on line at about the same time as the Kingston-Bedford/Essex project. Any delivery system problems or inadequacies should be discussed with a clear strategy for remedial action.

Construction Impacts

A demolition and project construction schedule should be presented for the major project components. Demolition and construction methods that will contribute to noise and dust impacts in the area should be discussed and mitigation measures recommended to comply with DEQE regulations 310 CMR 7.09 and 7.10. Any asbestos removal should be inaccordance with 310 CMR 7.15.

Equipment, material and construction worker routing through the area to the project site should be mapped out. Explain the on and off site storage of equipment and materials staging areas, and vehicle parking. It should be demonstrated that the transportation routing plan and the on and off site staging and parking will minimally disrupt the area's daily activities.

The EIR should identify other projects in the area that will be in construction at the same time as the Kingston Bedford/Essex project. The combined impacts of overlapping construction should be assessed, and recommendations made to minimize the disruptions during the development phase.

Massing and Shadow Impacts

Graphic representations of the massing options and resulting shadow effects of the proposed project and alternatives should be presented. The shadow effects on key sensitive receptors in the

area, e.g. open-space areas, relocated Pagoda Park, the historic district and areas heavily used by pedestrians should be analyzed during the morning, midday and afternoon hours over a discrete range of season variations.

Wind Impacts

The draft EIR should include a qualitative wind analysis to determine the potential effects of the proposed developments on the ground wind environment in and around the project site. This preliminary analysis should consider the three project alternatives identified by the BRA, no build and an optional less dense, lower height alternative.

The final EIR will be expected to present more detailed quantitative wind tunnel testing and analysis when building designs and plans for open space areas become available.

In toto, the wind studies in both reports should take into account existing wind conditions, possible induced wind effects, probable impacts on ground wind velocities from mid and highrise building masses with consideration given to building locations and form, and design measures to mitigate for increased wind velocities, particularly around open space areas such as Pagoda Park and building entryways.

Housing/Growth Impacts

Of apparent concern to the Chinese community are the inevitable impacts of this mixed-use development on the housing market in Chinatown, one of Boston's oldest neighborhoods accordingly to the ENF. This section of the EIR should carefully evaluate the range of potential effects on the area's housing created by this project, taking into account the potential for induced demand on housing generated by the development which will drive up rents and property values.

The socio-economic study should define the neighborhoods most likely to be affected, based on proximity to the project. The housing stock within the defined area should be quantified and described. Historical and current trends with regard to the area's housing demand should be discussed. Also, changes in property values on several streets within the impact area should be analyzed over the past 10 years. The coincidental changes in

demographics, employment growth and employment data should be compared with the City of Boston, as a whole, over the same ten year period.

The EIR should consider the factors affecting changes in housing demand and property values. Further, the report should predict the significance of the Kingston-Bedford and Essex Street projects as a factor contributing to the changes in housing demand. The likely impacts on housing demand, rents and property values should be estimated in the EIR. Innovative programs and mitigation measures to moderate those effects should be specifically identified with a proposal for implementation that will respond in anticipation of the increased housing demand.

Miscellaneous

According to the Massachusetts Aeronautics Commission the project site is within the flight path of helicopters. Consideration should be given to the potential conflicts of use of the air rights over this site. The EIR should recommend a reasonable approach and solution to the potential conflict.

Distribution

To ensure the maximum participation of the Chinese community in the review of the Environmental Impact Report, it is highly recommended that a summary document be prepared in Chinese and circulated with clear instructions for its timely review and comment.

Since the BRA is fostering a high level of public participation in the EIR review process, it is expected that an adequate number of copies of the EIR, and executive summary, translated into Chinese will be made available to the public. Copies should be sent to agencies which have submitted comments on the ENF, in addition to the required MEPA distribution list. Copies of the report should also be sent to the Physical Plant at Tufts University (ATTN.: Lawrence Ball) and the New England Medical Center Hospitals (ATTN.: Jerome H. Grossman, M.D.).

August 8, 1986
DATE

JAMES S. HOYTE, SECRETARY

JSH/NB/bk

Appendix C: Air Quality Analysis Data

1. Air Quality Analysis Protocol
2. Emissions Generation by Wind Angle

APPENDIX C-1

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
Department of Environmental Quality Engineering
Division of Air Quality Control
One Winter Street, Boston 02108

S. RUSSELL SYLVA
Commissioner

September 29, 1986

10-1

Charles Levy, Project Manager
WCHI Industries, Inc.
14 Felton Street
Waltham, MA 02154

Reference: EOEA 6132 Kingston - Bedford/
Essex Street Development, Boston

Dear ~~Mr.~~ Charlie Levy:

I have reviewed your letter of September 24, 1986 summarizing the approach to the air quality analysis for the Kingston-Bedford/Essex St. Draft Environmental Impact Report (EOEA 6132). As per our discussion on September 26, I concur with the receptors selected, as well as the inputs and variables proposed for use in both the Mobile 3 and Caline 3 models. The intersections have been selected according to Levels of Service criteria contained in the MEPA Scope issued on July 9, 1986 and additional intersections selected during our August 27, 1986 site visit with Mr. Ed Lutter of WCHI.

Should you have any questions please call at 292-5708.

Very truly yours,

Jerome Grafe
Environmental Planner

JG/efj.

cc: Nancy Baker, MEPA
Richard Mertens, BRA
Michael Maher, DEQE Northeast Region

Jerome Grafe
292-5708

WCHI
Management Consultants

SCIENCE • ENGINEERING • ANALYSIS

September 24, 1986

Mr. Jerome Grafe
Dept. of Environmental Quality Engineering
Division of Air Quality Control
One Winter St.
Boston, MA 02108

REFERENCE: EOEA No. 6132
Kingston-Bedford/Essex St. Development, Boston

Move down

Dear Mr. Grafe:

On August 27, 1986, Mr. Ed Luttmer of our firm and I met with you to discuss the air quality analysis for the referenced development. Among other items of discussion, we ~~used~~ reviewed a map of the site to identify intersections where sensitive receptors might be located. We also visited the site.

Based on our discussion and site visit, the following intersections will be analyzed for air quality:

Single ~~Double~~ Space

Bedford/Kingston
Bedford/Columbia
Bedford/Summer/Lincoln
Otis/Kingston/Summer
Essex/Surface Artery
Essex/Columbia
Essex/Kingston
Essex/Edinboro
Essex/Washington (DEQE monitor location)

Sketches of each of these intersections showing the streets on a scale of 1" = 50' are enclosed. Locations of the sensitive receptors are indicated by enlarged asterisk symbols and traffic flow directions are shown by arrows.

Methodologies which will be applied to the microscale air analysis will include MOBILE3* and CALINE3**. For the analysis, the existing background year is 1987 and the future build and no-build year is 1990. The background CO concentrations to be used are:

Year	1-Hour	8-Hour
1987	6.0	3.6
1990	6.0	3.6

*EPA, User's Guide to MOBILE 3: Mobile Source Emissions Model, EPA-460/3-84-002, Ann Arbor, MI, June 1984.

**California Department of Transportation, 1979. CALINE 3 - a versatile dispersion model for predicting air pollutant levels near highways and arterial streets. Federal Highway Administration FHWA/CATL-79/23.

The analysis inputs are as follows:

Temperature	-	33°F
Daily Stability	-	Class D
Wind Speed	-	1 meter/second for both 1-hour and 8-hour
Wind Direction	-	Worst case as identified by applying 20° increments
Initial Vertical Mixing Height	-	550 meters
Average Vehicle Length	-	4.35 meters
Vehicle Mix	-	MOBILE3 default

Emission Factors - I/M credit. 13% stringency, no mechanics training or anti-tampering, starting model year 1972, and 1983 as the beginning of the program.

Vehicle Age	-	Mass. light duty vehicles (July 1, 1983), other categories default

The hot and cold start percentages are:

	INTERSECTION 1-hour	INTERSECTION 8-hour
% vehicle miles (accumulated in cold start, non-catalyst)	50.0	20.6
% vehicle miles (accumulated in hot start, non-catalyst and catalyst)	10.0	27.0
% vehicle miles (accumulated in cold start, by catalyst)	50.0	20.3

If there are any questions please do not hesitate to contact us.

Sincerely,

WCH Industries, Inc.

CHARLES LEVY
Project Manager

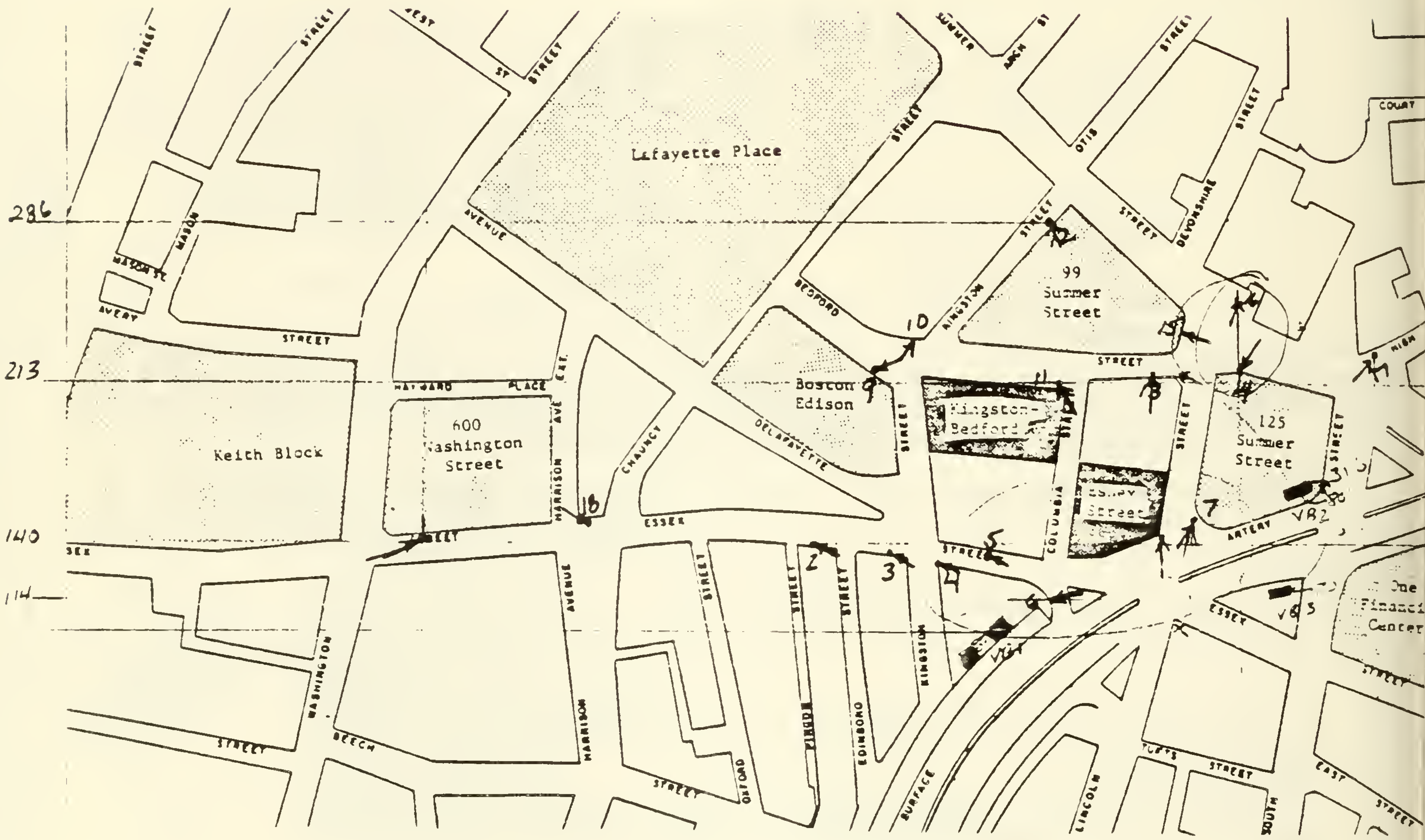
CL/cdp

Enclosures (8)

WCHI

172 = 5.18 cm vert (y) axis = 33.2 yd/cm

437 yd = 13.02 cm 33.5 yd/cm



206 582 643

$$VB1 = x = \overset{(4)}{441} + (5\times 3.3) = 45?$$
$$y = \overset{(6)}{114} - (7\times 3.3) = 91 \quad Z = 20'$$

$$VB2 = y = \overset{7}{157} - (4\times 3.3) \quad 163.20 \quad Z = 80'$$
$$x - \overset{7}{513} + (14 \times 3.3) \quad 609.$$

$$VB3 = x = \overset{14}{582} + (5 \times 3.3 \quad 599 \quad Z = 70'$$
$$y = \overset{6}{114} + (1 \times 3.3) \quad 117$$

Figure 3-1. RECENT AND PROPOSED AREA DEVELOPMENTS

RECEPTOR	EXISTING	1.3 m/s	1.0 m/s	NO BUILD	1.3 m/s	1.0 m/s	#2 900K ⌀	1.3 m/s	1.0 m/s	#3 725K⌀			#4 580K⌀			#5 730K ⌀		
1	260°	5.3	5.2	260	5.2	5.1	240-260° 100°	5.3 → 4.9 →	5.2 4.7									
2	100	5.7	5.7	100	5.8		100	6.2 →	6.4									
3	100	6.3	6.5	100	6.7		100	7.1	7.6									
4	100	7.4	7.9	100	7.7	8.3	100	8.0	8.7									
5	100	8.8	9.8	100	9.2	10.3	100	9.5	10.7									
6	80	9.2	10.3	80	9.5	10.7	80	10.0	11.3									
7	200	10.0	11.3	200	10.5	12.0	200	11.0	12.6	200	11.0	12.6	200	10.9	12.5	200	10.2 why	11.6
8	180	9.1	11.1	180	10.1	11.5	180-200	10.6	12.1									
9	60	5.4	5.3	60	5.4		60	5.5	5.5									
10	220	5.4	5.3	140	5.5		140	5.7	5.7									
11	160	5.6	5.6	160	5.8		160	5.9	6.0									
12	160	4.8	4.6	160	4.9		160	5.0	4.8									
13	130	5.6	5.6	180	5.7		180	5.4	6.0									
14	20-40	6.7	7.0	20	8.7	9.6	20	9.2	10.3							200	6.7	
15	100	6.1	6.3	100	7.1		100	7.6	8.2									
16	[illegible]	7.6	8.2	180	9.1	10.2	180	9.9	11.2							200	7.6	
17	[illegible]	7.0	7.4	100	7.3	7.8	240	7.4	7.9									
18	300	5.5	5.5	300	5.5		80 300	5.5 5.5	5.5 5.5									

3 H C

[illegible]	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
20	3.6	3.8	4.1	3.8	3.7	7.5	4.9	4.7	4.4	3.9	3.9	4.0	4.1	9.2	3.9	3.8	3.6	4
40	3.6	3.9	4.4	4.0	3.8	8.0	4.6	4.9	50	4.0	40	4.1	3.9	9.1	3.9	3.8	3.7	3
60	3.7	3.9	4.8	4.7	4.3	8.8	4.4	4.8	5.5	4.3	4.1	3.8	4.5	7.5	4.1	3.9	4.5	3
80	4.4	5.0	5.9	6.9	6.3	10.0	4.4	5.0	5.4	4.8	4.8	3.9	5.3	5.9	5.3	4.6	6.1	5
100	4.9	6.2	7.1	8.0	9.5	9.0	4.5	6.4	4.7	5.4	4.5	4.8	5.1	5.3	7.6	5.0	7.3	5
120	4.5	5.0	5.6	5.9	7.7	6.5	4.8	8.7	5.1	5.2	4.1	4.8	4.4	4.5	6.5	7.3	7.2	4
140	4.2	4.5	4.8	4.8	5.1	4.8	5.5	9.9	5.3	5.7	5.1	4.4	4.4	4.0	4.8	8.8	6.8	4.
160	4.1	4.3	4.6	4.6	4.7	4.5	7.6	10.3	4.5	4.9	5.9	5.0	5.5	4.1	5.1	9.4	6.1	4.
180	4.1	4.1	4.4	4.6	4.6	4.5	9.7	10.6	3.9	5.2	5.4	4.7	5.9	4.9	6.0	9.9	5.6	4
200	4.1	4.1	4.1	4.4	4.4	4 4	11.0	10.6	3.7	5.2	4.2	4.1	4.2	6.3	4.7	9.6	5.8	4..
220	4.5	4.1	4.2	4.4	4.3	3.9	10.0	8.6	3.7	5.4	3.8	4.3	4.0	5.9	4.3	6.6	7.3	4.
240	5.3	4.2	4.4	4.7	4.4	3.6	7.4	7.5	3.7	5.0	3.8	4.1	3.8	4.8	4.1	4.5	7.4	4.
260	5.3	4.4	4.6	5.0	4.6	3.9	5.8	6.7	3.8	4.2	3.8	3.9	3.8	4.4	4.2	4.1	7.1	4.5
280	4.2	4.0	4.2	4.9	4.2	4.1	4.4	4.5	3.7	3.8	3.9	3.8	3.9	4.2	4.2	4.3	5.6	4.
300	3.7	3.6	3.7	4.5	4.0	4.5	4.0	3.7	3.7	3.8	3.8	3.8	3.8	4.3	3.9	4.7	4.2	5.[illegible]
320	3.7	3.6	3.6	4.7	3.9	5.2	4.2	3 7	3.7	3.8	3.7	3.8	3.8	4.9	4.4	4.4	3.6	52
340	3.7	3.6	3.6	4.6	3.9	6.5	4.5	3.8	3.7	3.8	3.7	3.8	3.9	6.0	4.6	4.0	3.6	4.
[illegible]	3.6	3.6	3.8	4.2	3.7	7.3	4.9	4.1	3.9	3.8	3.8	3.8	4.1	7.9	4.2	3.9	3.6	4.

WCHI
Management Consultants

SCIENCE • ENGINEERING •ANALYSIS

May 25, 1988

Mr. Jerome Grafe
Department of Environmental Quality Engineering
Division of Air Quality Control
One Winter Street
Boston, MA 02108

REFERENCE: EOEA No. 6133 - Parcel 18 Development, Boston

Dear Mr. Grafe:

This is to seek your approval of the proposed adjustments to the CO modeling results we have discussed regarding the referenced project. As you know, the models were run with wind speeds of 1.3 meters/second and background concentrations of 3.6 ppm and 6.0 ppm for the 8-hour and 1-hour scenarios respectively.

Modeling parameters, however, required a 1.0 meters/second wind speed. Lower background levels of 3.0 ppm and 5.0 ppm are now allowed for the 8-hour and 1-hour scenarios respectively (DEQE memo 12/87).

To adjust the 8-hour model results, a factor of 1.3 will be applied to the free flow and queue portions of CO concentrations previously obtained from the CALINE-3 and CAL-Q 3 models. This factor is based on the reduction of the volume of air available for the dilution of the CO emissions by the 1.3 factor. The resulting concentration then increases by the same 1.3 factor. The background level will then be reduced from 3.6 ppm to 3.0 ppm. The following expression is used for the results at each receptor location:

$$(CO_{model} - 3.6 \text{ ppm}) \cdot 1.3 + 3.0 \text{ ppm} = CO_{revised}$$

☒ WCH Industries, Inc. 14 Felton Street, Waltham, MA 02154 · (617) 894-7022
☐ WCHI DC Associates, P.O. Box 44-1040, Fort Washington, MD 20744 · (301) 292-6460

The 1-hour model results will be similarly revised to reflect the lower wind speed and background levels. The corresponding expression is:

$$(CO_{model} - 6.0 \text{ ppm}) \cdot 1.3 + 5.0 = CO_{revised}$$

The resulting CO levels will also be adjusted for other local stationary sources.

If you have any questions or comments, do not hesitate to contact myself or Ed Luttmer.

Sincerely,

WCH Industries, Inc.

Charles Levy

CHARLES LEVY, P.E.
Project Manager

CL:slh

cc: Richard Mertens, BRA

WCHI

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
Department of Environmental Quality Engineering
Division of Air Quality Control
One Winter Street, Boston 02108

Daniel S. Greenbaum
Commissioner

July 27, 1988

Mr. Charles Levy P.E.
WCH Industries
14 Felton Street
Waltham, MA 02154

RE: Kingston/Bedford, Essex Street Development and Parcel 18 Development, Boston - EOEA Nos. 6132 and 6133

Dear ~~Mr. Levy~~ Charlie:

I've reviewed your letters of May 25, 1988 and additional information provided previously by Mr. Ed Luttmer of your office. As you know, the original analysis approved in September 1986 included a 1.0 m/s wind speed model input parameter and carbon monoxide (CO) backround concentrations of 3.6 ppm and 6.0 ppm for the 8-hour and 1-hour scenario respectively. The actual analysis however was run at 1.3 m/s wind speed resulting in misleading outputs.

DAQC has since lowered recommended urban CO backround concentrations from 3.6 ppm to 3.0 ppm and from 6.0 ppm to 5.0 ppm. The original air quality analysis must be corrected but the model itself need not be re-run. DAQC concurs with your proposed model adjustment applying the 1.3 factor to the free flow and queue portions of CO concentrations obtained in the original analysis.

Should you have any questions regarding this letter, please call me at 292-5630.

Sincerely,

Jerome Grafe

JG/efj.

cc: Michael Scherer, DAQC
Richard Mertens, BRA

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APPENDIX C-2

Kingston/Bedford — AM PEAK EXISTING

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
20°	5.0	5.4	6.1	5.8	5.3	8.2	7.5	8.4	5.6	5.9	5.6	6.0	5.9	9.5	5.9	5.8	5.0	5.8
40°	5.1	5.4	6.7	6.1	5.5	10.8	5.9	8.2	6.5	6.6	5.8	6.0	5.7	9.3	6.0	5.8	5.1	6.0
60°	5.7	5.9	7.3	6.9	6.0	13.1	5.9	7.8	7.3	7.4	5.9	5.5	6.4	8.3	6.1	5.8	5.4	6.0
80°	6.9	7.1	8.0	10.0	7.7	11.3	6.0	7.7	7.1	8.3	6.3	5.2	6.9	7.2	7.5	6.1	5.7	6.7
100°	8.2	8.6	10.0	11.5	10.8	9.2	5.8	7.9	6.5	8.1	6.6	5.7	7.6	6.6	9.5	7.0	6.3	7.8
120°	7.4	7.7	8.5	9.2	9.5	7.3	5.9	8.2	6.7	7.6	5.9	6.4	7.2	6.0	9.0	9.2	6.9	7.1
140°	6.9	7.1	7.5	7.5	7.6	6.0	6.1	9.4	6.7	7.6	6.6	6.4	6.5	5.6	8.0	9.8	7.3	7.1
160°	6.6	6.8	7.2	7.2	7.2	5.7	6.3	11.7	6.1	6.9	7.7	6.7	6.9	5.6	8.5	9.7	7.5	7.1
180°	6.7	6.6	7.0	7.0	7.2	5.8	8.2	13.0	5.7	6.9	6.9	6.4	7.6	6.4	9.1	10.7	8.0	7.1
200°	6.8	6.6	6.8	6.8	6.9	5.7	11.8	11.6	5.4	6.8	5.7	5.9	6.4	9.3	7.9	12.3	8.1	6.8
220°	7.4	6.7	7.1	7.0	6.9	5.2	12.4	10.7	5.4	6.5	5.5	6.5	5.7	10.0	6.4	10.0	8.8	6.6
240°	8.5	7.1	7.6	7.9	7.3	5.0	11.5	11.4	6.0	6.4	5.6	7.0	5.5	9.0	6.6	7.6	8.7	7.0
260°	8.9	7.7	8.5	9.5	7.9	5.8	9.8	10.5	5.9	6.0	5.9	6.3	5.6	8.0	7.4	7.4	8.4	7.7
280°	6.7	6.6	7.1	9.3	7.2	7.2	7.9	6.6	5.4	5.5	5.6	5.8	5.7	7.8	7.2	7.1	7.6	7.9
300°	5.6	5.3	5.4	7.1	6.0	7.3	7.3	5.2	5.5	5.7	5.9	5.7	5.7	7.9	6.2	7.4	5.8	8.7
320°	5.6	5.1	5.2	7.2	5.5	7.0	7.5	5.6	5.6	5.8	5.7	5.7	5.7	8.1	6.0	7.0	5.1	8.5
340°	5.4	5.2	5.2	7.3	5.5	6.8	8.2	5.5	5.6	5.7	5.6	5.6	5.7	8.3	6.3	6.3	5.0	7.1
360°	5.1	5.2	5.4	6.5	5.4	6.7	9.1	6.6	5.6	5.7	5.6	5.7	5.9	9.3	6.3	5.9	5.0	6.1
MAX	8.9	8.6	10.0	11.5	10.8	13.1	12.4	13.0	7.3	8.3	7.7	7.0	7.6	10.0	9.5	12.3	8.8	[illegible]

[illegible] DEIR ALT. [illegible] RUN 1 Hr PM PEA[illegible]

Kingston / Bedford PM PEAK – EXISTIN[illegible]

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
20°	5.0	5.7	6.8	6.1	5.3	8.4	6.5	7.0	6.6	6.2	5.6	7.0	5.9	9.3	5.8	5.7	5.0
40°	5.2	5.9	7.1	6.1	5.4	10.5	5.6	6.7	8.1	8.0	5.6	6.8	5.7	9.3	5.9	5.7	5.1
60°	6.0	5.9	7.1	7.1	5.7	12.4	5.7	6.8	9.5	9.2	5.7	5.7	6.1	8.3	6.0	5.8	5.4
80°	7.2	7.0	8.2	10.8	7.7	11.4	5.8	7.1	8.6	9.7	6.1	5.2	6.8	7.2	7.2	6.1	5.[illegible]
100°	9.0	9.1	10.9	12.6	11.4	9.6	6.2	8.5	6.9	9.6	6.0	5.7	6.8	6.4	8.8	6.9	6.6
120°	8.2	8.5	9.5	10.2	10.3	7.9	6.5	9.8	7.1	8.9	5.7	6.2	6.2	5.6	8.3	8.9	7.2
140°	7.5	7.8	8.4	8.3	8.5	6.6	6.9	11.1	7.3	9.0	6.6	6.1	6.2	5.4	7.1	9.4	7.3
160°	7.0	7.2	7.9	8.0	7.9	6.2	8.1	12.1	6.7	8.5	7.9	6.9	7.0	5.7	7.6	9.7	7.2
180°	7.1	7.0	7.6	7.7	8.0	6.2	10.4	12.7	6.0	8.7	7.1	6.5	7.8	6.8	8.4	10.6	7.0
200°	7.1	7.0	7.3	7.3	7.4	6.1	12.7	11.8	5.5	8.4	5.9	6.5	6.8	8.5	7.7	11.3	7.8
220°	7.7	7.2	7.6	7.5	7.3	5.4	12.2	10.5	5.6	8.1	5.7	7.7	5.7	8.7	6.4	8.8	8.9
240°	8.7	7.6	8.3	8.7	7.9	5.0	10.3	10.8	6.2	7.7	6.0	8.6	5.8	7.7	6.6	7.3	8.2
260°	9.0	8.2	9.4	10.6	8.8	5.9	9.1	10.3	6.1	6.9	6.2	7.2	6.1	7.4	7.5	7.4	8.2
280°	6.8	6.8	7.5	10.3	7.6	8.0	7.1	6.8	5.6	5.7	6.1	6.6	6.0	7.0	7.2	7.0	7.5
300°	5.5	5.4	5.5	7.7	6.2	7.9	6.4	5.5	5.6	5.6	6.2	6.5	6.1	6.8	6.2	7.4	6.0
320°	5.5	5.2	5.3	7.7	5.7	7.7	6.5	5.5	5.5	5.7	5.9	6.5	5.8	7.3	6.1	6.8	5.1
340°	5.3	5.2	5.2	7.7	5.9	7.5	6.9	5.3	5.7	5.7	5.6	6.5	5.7	7.8	6.3	6.3	5.1
360°	5.1	5.2	5.8	7.3	5.6	7.2	7.3	6.0	5.9	5.7	5.6	6.8	5.9	8.9	6.2	5.9	5.0
MAX	9.0	9.1	10.9	12.6	11.4	12.4	12.7	12.7	9.5	9.7	7.9	8.6	7.8	9.3	8.8	11.3	8.9

KB DEIR ALT. KB7HEO.DAT RUN 8 Hr Existing

Kingston Bedford 3 Hour Existing

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
20°	3.0	3.3	3.8	3.5	3.1	4.0	3.8	3.9	3.3	3.5	3.3	4.0	3.5	6.0	3.3	3.3	3.0	3.[illegible]
40°	3.1	3.4	4.1	3.4	3.1	5.5	3.3	3.8	4.1	4.2	3.2	3.9	3.3	5.2	3.3	3.3	3.1	3.[illegible]
60°	3.4	3.2	4.1	4.0	3.3	6.8	3.3	3.5	4.8	4.5	3.3	3.4	3.6	3.9	3.4	3.3	3.1	3.[illegible]
80°	3.9	4.1	4.7	5.8	4.5	6.7	3.3	3.7	4.6	5.2	3.6	3.1	3.9	3.6	4.1	3.4	3.6	3.[illegible]
100°	4.8	4.9	5.7	6.6	6.2	5.4	3.5	4.0	3.6	5.3	3.4	3.4	3.9	3.7	4.9	4.0	4.3	4.[illegible]
120°	4.4	4.5	4.9	5.5	5.6	4.2	3.7	4.3	4.0	5.0	3.3	3.4	3.6	3.4	4.5	4.4	4.7	4.[illegible]
140°	4.1	4.3	4.5	4.4	4.6	3.7	3.7	5.4	4.2	4.8	3.8	3.4	3.5	3.2	3.9	4.6	4.6	4.[illegible]
160°	3.9	4.0	4.3	4.2	4.3	3.5	3.8	7.0	3.8	4.6	4.7	3.9	4.0	3.3	4.5	5.4	4.2	4.5
180°	3.9	3.9	4.2	4.1	4.2	3.5	4.8	8.2	3.5	4.9	4.0	3.6	4.6	3.7	5.0	6.5	4.0	4.[illegible]
200°	4.0	3.9	4.0	4.0	4.0	3.5	6.7	7.5	3.2	4.9	3.3	3.5	3.8	4.7	4.5	6.7	4.4	4.1
220°	4.2	3.9	4.1	4.1	4.0	3.2	7.1	6.4	3.2	4.4	3.3	4.1	3.2	4.8	3.7	5.3	5.2	3.9
240°	4.7	4.2	4.4	4.6	4.3	3.0	5.9	6.5	3.5	4.1	3.4	4.2	3.4	4.5	3.6	3.9	5.0	4.0
260°	4.9	4.6	4.8	5.3	4.5	3.3	4.8	5.7	3.5	3.3	3.2	4.0	3.2	4.0	4.0	3.8	4.4	4.3
280°	3.9	3.7	4.2	5.2	4.1	4.1	3.9	3.8	3.3	3.3	3.3	3.8	3.3	3.8	3.8	3.9	3.9	4.7
300°	3.2	3.2	3.1	4.2	3.7	4.2	3.4	3.0	3.3	3.3	3.4	3.7	3.3	3.8	3.5	4.0	3.4	5.3
320°	3.2	3.1	3.1	4.4	3.3	4.0	3.7	3.2	3.3	3.3	3.3	3.6	3.3	4.0	3.5	4.0	3.0	5.3
340°	3.1	3.1	3.0	4.4	3.4	4.0	3.8	3.2	3.3	3.3	3.3	3.7	3.3	4.7	3.7	3.6	3.0	4.3
360°	3.0	3.1	3.3	4.0	3.3	4.0	4.2	3.5	3.3	3.4	3.3	3.7	3.5	5.6	3.6	3.3	3.0	3.9
MAX	4.9	4.9	5.7	6.6	6.2	6.8	7.1	8.2	4.8	5.3	4.7	4.2	4.6	6.0	5.0	6.7	5.2	5.3

NO UEIR ALT. KBH|NE.CHT RUN 1 Hr Am Pea

Kingston | Bedford — Am PEAK – NO-BUILD

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
20°	5.0	5.4	6.0	5.8	5.2	7.7	7.8	8.7	5.8	6.3	5.8	6.1	6.0	7.5	6.3	6.0	5.0
40°	5.2	5.5	6.3	6.1	5.6	9.5	5.9	8.4	6.5	7.1	5.8	5.9	6.1	7.5	6.4	6.0	5.1
60°	5.8	5.7	6.7	7.2	6.1	10.6	6.0	8.1	7.0	7.9	6.1	5.4	6.5	7.3	6.6	6.0	5.3
80°	6.7	6.8	7.7	9.8	7.3	9.7	6.0	8.3	7.1	8.5	6.3	5.2	7.0	6.7	7.7	6.3	5.6
100°	8.4	8.2	9.6	11.2	9.7	8.3	6.0	9.7	6.5	8.0	6.7	5.7	7.4	6.4	9.6	7.3	5.9
120°	7.6	7.8	8.6	9.5	9.3	7.3	6.5	10.3	6.3	7.3	6.2	6.4	7.2	5.9	9.4	9.1	6.2
140°	7.1	7.2	7.7	7.8	7.9	6.3	7.6	10.5	6.4	7.3	6.6	6.5	7.1	5.6	8.5	9.1	7.0
160°	6.8	6.9	7.3	7.3	7.3	5.8	8.6	10.7	6.0	7.0	7.2	6.9	7.2	5.7	9.2	8.2	7.4
180°	6.8	6.7	7.2	7.1	7.3	5.7	9.6	10.8	5.7	6.8	6.5	6.3	7.1	6.7	9.7	9.1	7.8
200°	7.0	6.7	7.0	7.0	7.1	5.6	11.8	9.8	5.4	6.5	5.6	6.1	6.2	9.6	8.2	11.1	8.0
220°	7.5	6.9	7.3	7.1	7.1	5.2	11.7	8.7	5.4	6.3	5.6	6.6	5.5	10.0	6.9	9.5	8.4
240°	8.4	7.3	7.8	8.2	7.5	5.0	10.3	8.9	6.1	6.2	5.8	7.2	5.6	9.1	7.2	7.9	8.2
260°	8.7	7.9	8.7	9.9	8.1	5.8	9.3	8.6	5.9	5.9	5.6	6.7	5.5	8.1	8.5	8.1	8.4
280°	6.9	6.5	7.2	9.4	6.9	7.3	8.0	6.4	5.5	5.6	5.8	5.9	5.9	8.2	8.3	7.7	7.5
300°	5.6	5.5	5.4	6.9	5.7	7.3	7.6	5.2	5.5	6.0	6.2	5.9	6.1	8.3	6.8	7.9	5.8
320°	5.6	5.3	5.3	6.9	5.5	7.0	8.0	5.6	5.8	6.1	6.0	5.8	6.0	8.1	6.1	7.3	5.2
340°	5.4	5.3	5.3	6.8	5.6	7.1	8.8	5.6	5.8	6.1	5.9	5.7	5.8	8.2	6.4	6.6	5.0
360°	5.1	5.4	5.5	6.5	5.4	6.9	9.7	6.5	5.8	6.2	5.8	5.8	5.9	7.8	6.4	6.1	5.0
MAX	8.7	8.2	9.6	11.2	9.3	10.6	11.8	10.8	7.1	8.5	1.7	7.2	7.4	10.0	9.7	11.1	8.4

ALT. RUN

Kingston/Bedford — PM PEAK - NO BUILD PM PEAK

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
20°	5.0	5.8	6.8	6.4	5.4	11.2	6.5	7.0	6.8	6.4	5.6	6.9	6.1	7.6	6.0	5.8	5.0	[illegible]
40°	5.3	5.9	6.9	6.4	5.4	11.4	5.6	6.7	7.6	7.9	5.8	6.5	5.8	7.9	6.1	5.8	5.1	6.8
60°	6.0	5.9	7.0	8.0	5.9	11.4	5.6	6.7	8.6	8.9	5.8	5.5	6.2	7.7	6.2	5.8	5.7	6.8
80°	7.4	7.2	9.0	12.7	9.0	10.0	5.8	7.4	8.0	9.0	6.0	5.3	6.7	7.3	7.4	6.1	6.5	7.2
100°	10.0	10.0	12.4	14.8	13.8	8.7	6.7	8.9	6.8	8.7	6.0	5.7	6.5	6.4	8.9	7.2	6.9	9.2
120°	9.2	9.4	10.7	11.8	12.9	8.0	7.5	9.5	7.0	8.1	5.9	6.2	6.3	5.5	8.2	9.1	6.8	8.9
140°	8.3	8.6	9.3	9.3	10.0	7.0	8.3	9.5	7.8	8.7	6.5	6.1	6.3	5.5	7.3	9.0	6.6	8.6
160°	7.8	7.9	8.7	8.7	8.7	6.4	8.8	9.8	6.9	8.8	7.4	6.7	6.9	5.8	7.8	8.4	6.6	8.9
180°	7.8	7.7	8.5	8.4	8.7	6.3	9.4	10.4	6.1	8.9	7.5	6.8	7.3	6.8	8.5	9.1	7.0	9.1
200°	7.8	7.7	8.1	8.0	8.2	6.1	10.9	10.0	5.6	8.1	6.4	6.5	7.1	8.4	7.9	10.0	7.8	8.1
220°	8.5	8.0	8.5	8.3	8.2	5.4	10.5	9.3	5.8	7.6	5.9	7.9	6.1	8.5	7.1	8.7	8.5	7.7
240°	9.7	8.6	9.5	10.0	9.0	5.0	9.6	9.8	6.4	7.6	6.1	8.6	6.0	7.7	7.2	7.7	8.0	8.1
260°	10.0	9.2	10.7	12.5	9.9	6.3	9.5	10.7	6.2	7.0	6.2	7.5	6.2	7.4	8.2	8.0	8.3	8.5
280°	7.2	7.0	8.2	11.9	8.0	8.9	7.3	7.3	5.7	6.1	6.1	6.7	6.2	7.0	7.9	7.3	7.5	7.2
300°	5.5	5.4	5.6	8.3	6.3	9.7	6.6	5.5	5.9	6.0	6.3	6.6	6.2	7.2	6.6	7.6	6.0	7.0
320°	5.5	5.4	5.4	7.8	6.0	10.8	6.6	5.6	6.2	5.9	5.9	6.5	6.0	7.3	6.3	6.9	5.1	7.2
340°	5.3	5.3	5.3	7.9	5.9	11.2	7.0	5.4	6.5	6.0	5.9	6.4	5.9	7.3	6.4	6.2	5.0	7.2
360°	5.1	5.4	5.9	7.2	5.6	11.0	7.5	6.0	6.6	6.1	5.7	6.7	6.0	7.5	6.2	5.9	5.0	7.2
MAX	10.0	10.0	12.4	14.8	13.8	11.4	10.9	10.7	8.6	9.0	7.5	8.6	7.3	8.5	8.9	10.0	8.5	9.1

Kingston / Bedford — 8 Hour - NO BUIL

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
20°	3.0	3.4	3.7	3.6	3.1	5.3	3.7	3.9	4.2	3.6	3.4	3.9	3.5	4.8	3.5	3.3	3.0
40°	3.1	3.4	3.9	3.6	3.1	6.6	3.2	3.8	4.5	4.3	3.4	3.7	3.3	4.7	3.5	3.3	3.1
60°	3.4	3.3	3.9	4.2	3.2	6.6	3.1	3.5	4.9	4.6	3.4	3.3	3.6	4.1	3.6	3.4	3.2
80°	4.0	4.0	4.7	6.3	4.6	6.1	3.3	3.7	4.4	4.9	3.5	3.1	3.7	3.7	4.1	3.5	3.5
100°	5.2	5.4	6.3	7.2	6.4	5.0	3.6	4.4	3.7	4.8	3.2	3.3	3.6	3.4	4.8	3.9	3.9
120°	4.9	4.8	5.5	5.9	5.8	4.1	3.7	5.1	4.0	4.8	3.3	3.4	3.5	3.3	4.3	4.4	4.2
140°	4.5	4.6	4.9	4.9	4.9	3.8	3.8	5.7	4.2	4.8	3.8	3.6	3.6	3.2	4.2	4.8	4.1
160°	4.2	4.3	4.7	4.6	4.7	3.6	4.4	6.1	3.9	4.4	4.3	3.9	3.9	3.3	4.3	5.1	3.8
180°	4.2	4.2	4.5	4.6	4.6	3.6	5.4	6.2	3.5	4.8	4.1	3.7	4.3	3.7	4.6	5.4	3.9
200°	4.3	4.2	4.4	4.4	4.4	3.5	6.4	5.9	3.3	4.6	3.6	3.8	4.1	4.8	4.5	5.7	4.2
220°	4.6	4.3	4.6	4.5	4.4	3.2	6.1	5.3	3.3	4.4	3.4	4.2	3.4	4.6	3.8	4.6	4.7
240°	5.2	4.6	4.9	5.2	4.7	3.0	5.5	5.8	3.5	4.3	3.4	4.4	3.4	4.3	4.0	4.0	4.3
260°	5.4	5.0	5.6	6.3	5.1	3.4	4.9	5.6	3.7	4.0	3.4	4.0	3.4	3.9	4.3	4.0	4.3
280°	4.0	4.1	4.5	6.0	4.1	4.5	3.9	3.8	3.3	3.5	3.4	3.7	3.4	3.8	4.2	4.0	4.0
300°	3.2	3.2	3.3	4.3	3.5	4.6	3.5	3.1	3.3	3.4	3.4	3.7	3.4	3.9	3.6	4.1	3.4
320°	3.2	3.1	3.2	4.3	3.3	4.3	3.7	3.2	3.3	3.4	3.4	3.7	3.4	4.0	3.6	4.0	3.0
340°	3.1	3.2	3.1	4.3	3.4	4.3	3.8	3.2	3.6	3.4	3.3	3.6	3.3	4.3	3.8	3.6	3.0
360°	3.0	3.2	3.6	4.0	3.3	4.6	4.2	3.4	3.9	3.5	3.3	3.7	3.5	4.5	3.7	3.4	3.0
MAX	5.4	5.4	5.6	7.2	6.4	6.6	6.4	6.2	4.9	4.9	4.3	4.4	4.3	4.8	4.8	5.7	4.7

RUN — AM PEAK - BUILD

Kingston/Bedford

AM PEAK - BUILD

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
20°	5.0	5.4	6.6	9.5	5.4	11.1	7.9	8.8	5.8	6.3	5.8	6.2	6.0	7.3	6.2	6.0	5.0	5.[illegible]
40°	5.2	5.4	7.2	10.6	6.1	11.8	5.8	8.5	6.6	7.2	5.8	6.0	6.1	7.2	6.4	6.0	5.1	6.[illegible]
60°	5.8	6.0	8.4	13.7	7.1	11.6	6.0	8.1	7.2	8.1	6.0	5.4	6.5	6.8	6.6	6.1	5.3	6.[illegible]
80°	7.5	9.3	14.1	20.9	11.0	9.9	6.0	8.4	6.9	8.4	6.2	5.2	6.9	6.4	7.8	6.4	5.6	7.[illegible]
100°	9.9	15.2	20.2	22.6	17.5	8.4	6.0	9.8	6.5	7.9	6.6	5.5	7.4	6.3	9.3	7.2	5.9	9.[illegible]
120°	8.6	14.9	17.9	16.6	17.5	7.3	6.5	10.4	6.7	7.5	6.2	6.4	7.4	5.9	9.2	8.8	6.3	8.[illegible]
140°	7.8	13.2	14.9	12.6	14.8	6.3	7.6	10.5	7.4	8.0	6.6	6.5	7.1	5.6	8.6	8.8	7.0	7.[illegible]
160°	7.4	12.2	13.5	11.5	13.3	5.8	8.6	10.8	7.4	8.2	7.3	7.0	7.2	5.7	9.2	8.1	7.4	7.[illegible]
180°	7.4	12.1	13.4	11.2	13.8	5.7	9.6	10.9	7.0	8.1	7.2	6.9	7.2	6.7	9.8	9.0	7.8	7.[illegible]
200°	7.6	11.9	13.2	11.1	13.0	5.7	12.0	9.8	6.5	7.7	6.9	7.1	7.0	9.8	8.5	11.3	8.0	7.[illegible]
220°	8.3	12.7	14.4	12.0	14.0	5.2	11.9	9.0	5.9	6.8	6.9	7.4	6.8	10.7	7.7	10.3	8.6	7.2
240°	9.1	13.2	16.9	15.4	16.2	5.0	11.3	10.3	6.2	6.5	6.6	7.6	6.5	10.2	7.9	8.8	9.0	7.7
260°	9.3	12.1	18.7	21.7	18.0	6.9	11.7	12.0	6.2	6.0	5.8	6.9	5.7	8.4	8.4	8.2	8.7	8.[illegible]
280°	7.0	7.6	13.1	21.1	12.0	11.5	9.0	7.8	5.6	5.6	5.7	6.1	5.8	8.2	8.3	7.6	7.4	7.1
300°	5.6	5.6	7.2	13.7	6.9	12.2	7.7	5.3	5.6	5.9	6.1	6.0	6.1	8.3	6.9	7.9	5.9	7.1
320°	5.6	5.3	6.1	11.3	6.1	11.3	8.1	5.6	5.8	6.1	5.9	5.9	6.1	8.3	6.1	7.3	5.2	7.[illegible]
340°	5.4	5.3	5.6	10.6	5.6	11.0	9.0	5.6	5.9	6.0	5.9	5.9	5.8	8.1	6.3	6.6	5.0	6.3
360°	5.1	5.4	5.5	10.2	5.5	10.8	9.8	6.6	5.9	6.1	5.8	6.0	5.9	7.7	6.4	6.1	5.0	6.0
MAX	9.9	15.2	20.2	22.6	18.0	12.2	12.0	12.[illegible]	7.4	8.4	7.3	7.6	7.4	10.7	9.3	[illegible]	[illegible]	[illegible]

RUN

Kingston/Bedford — PM PEAK-

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
20°	5.0	5.8	7.0	6.4	5.4	11.3	6.5	7.0	6.9	6.4	5.7	7.0	6.1	7.6	6.0	5.8	5.0
40°	5.3	5.9	7.1	6.5	5.5	11.5	5.7	6.8	7.9	8.1	5.8	6.6	5.9	7.8	6.1	5.8	5.1
60°	6.1	5.9	7.1	8.2	6.0	11.4	5.7	6.8	8.7	9.2	5.9	5.5	6.2	7.7	6.3	5.9	5.7
80°	7.4	7.4	9.2	13.2	9.6	10.0	5.7	7.3	8.2	9.4	6.0	5.3	6.7	7.3	7.7	6.2	6.6
100°	10.2	10.2	12.6	15.3	15.1	8.8	6.4	8.8	6.8	8.8	6.0	5.8	6.5	6.5	8.9	7.2	6.9
120°	9.2	9.4	10.8	12.1	14.7	8.0	7.1	9.4	7.1	8.2	5.9	6.2	6.3	5.7	8.4	9.2	6.8
140°	8.4	8.6	9.4	9.3	11.4	7.1	7.8	9.6	8.0	8.9	6.5	6.1	6.3	5.5	7.5	9.0	6.7
160°	7.8	8.0	8.7	8.8	9.1	6.5	8.7	9.9	7.2	9.1	7.3	6.7	6.9	5.7	8.1	8.5	6.7
180°	7.9	7.7	8.5	8.5	8.8	6.3	9.4	10.4	6.2	9.2	7.4	6.8	7.3	6.7	8.5	9.0	7.2
200°	8.0	7.7	8.2	8.1	8.2	6.1	11.0	10.0	5.7	8.3	6.5	6.7	7.2	8.4	8.1	10.1	7.7
220°	8.6	8.0	8.6	8.4	8.3	5.4	10.7	9.3	5.9	7.8	6.0	8.0	6.2	8.6	7.2	8.9	8.5
240°	9.8	8.7	9.6	10.2	9.0	5.0	9.8	9.8	6.4	7.7	6.2	9.0	6.1	8.0	7.4	7.7	8.3
260°	10.1	9.2	10.8	12.6	10.0	6.3	9.7	10.8	6.3	7.4	6.3	7.7	6.4	7.4	8.4	8.2	8.7
280°	7.3	7.1	8.3	12.0	8.0	9.2	7.5	7.4	6.1	6.5	6.3	6.8	6.2	7.3	8.1	7.5	7.7
300°	5.5	5.4	5.6	8.3	6.3	10.6	6.7	5.6	6.7	6.1	6.4	6.7	6.2	7.3	6.7	7.7	6.0
320°	5.5	5.4	5.4	8.0	6.1	11.4	6.8	5.6	7.0	6.0	6.0	6.6	6.1	7.5	6.4	7.0	5.1
340°	5.3	5.3	5.4	8.1	6.0	11.4	7.1	5.4	6.9	6.0	6.0	6.5	5.9	7.3	6.5	6.3	5.0
360°	5.1	5.6	6.0	7.5	5.6	11.2	7.5	6.0	6.8	6.1	5.8	6.8	6.0	7.6	6.3	6.0	5.0
MAX	10.2	10.2	12.6	13.2	15.1	11.5	11.0	10.8	8.7	9.4	7.4	9.0	7.3	[illegible]	8.9	10.1	8.7

RUN

Kingston / Bedford · 8 HOUR - BUILD

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
20°	3.0	3.4	3.7	3.6	3.1	5.3	3.7	3.9	4.2	3.6	3.4	3.9	3.6	4.9	3.5	3.4	3.0	3.8
40°	3.1	3.4	3.8	3.6	3.1	6.6	3.3	3.8	4.6	4.4	3.4	3.7	3.4	4.9	3.5	3.4	3.1	3.[illegible]
60°	3.4	3.4	3.9	4.3	3.3	6.6	3.1	3.5	5.0	4.8	3.4	3.3	3.7	4.5	3.6	3.4	3.2	3.[illegible]
80°	4.0	4.0	4.8	6.4	4.6	6.2	3.3	3.7	4.6	5.1	3.6	3.1	3.7	4.0	4.2	3.5	3.5	4.1
100°	5.2	5.3	6.3	7.3	6.5	5.0	3.6	4.5	3.9	4.9	3.3	3.4	3.6	3.4	4.9	4.0	3.9	5.0
120°	4.9	4.9	5.6	6.0	5.9	4.1	3.7	5.1	4.0	4.8	3.3	3.4	3.5	3.3	4.5	4.8	4.1	4.8
140°	4.5	4.6	4.9	4.9	5.0	3.8	3.8	5.7	4.4	4.7	3.8	3.6	3.6	3.2	4.2	5.1	4.1	4.6
160°	4.2	4.4	4.7	4.6	4.7	3.6	4.4	6.1	3.9	4.6	4.3	3.9	3.9	3.3	4.3	5.2	3.8	4.8
180°	4.3	4.2	4.6	4.6	4.7	3.6	5.4	6.4	3.5	5.0	4.1	3.7	4.3	3.7	4.7	5.3	4.0	4.8
200°	4.3	4.2	4.4	4.4	4.4	3.5	6.4	5.9	3.3	4.6	3.6	3.8	4.1	4.8	4.5	5.9	4.3	4.4
220°	4.7	4.3	4.6	4.5	4.4	3.2	6.2	5.3	3.3	4.6	3.4	4.3	3.4	4.7	4.0	4.7	4.8	4.2
240°	5.2	4.7	5.0	5.2	4.7	3.0	5.5	5.9	3.6	4.4	3.4	4.6	3.4	4.3	4.0	4.0	4.3	4.3
260°	5.4	5.0	5.6	6.4	5.2	3.4	5.0	5.6	3.6	4.3	3.4	4.0	3.4	4.0	4.3	4.1	4.5	4.6
280°	4.0	4.2	4.5	6.1	4.1	4.5	3.9	3.8	3.4	3.6	3.6	3.8	3.5	3.8	4.2	4.1	4.1	4.2
300°	3.2	3.2	3.3	4.4	3.5	4.6	3.7	3.1	3.3	3.4	3.6	3.8	3.4	3.9	3.7	4.1	3.4	4.3
320°	3.2	3.1	3.2	4.3	3.2	4.3	3.7	3.2	3.5	3.4	3.4	3.8	3.4	4.1	3.6	4.1	3.0	4.3
340°	3.1	3.2	3.1	4.5	3.5	4.3	3.8	3.2	3.9	3.4	3.4	3.7	3.4	4.3	3.8	3.6	3.0	3.9
360°	3.0	3.2	3.6	4.0	3.3	4.6	4.2	3.4	4.1	3.5	3.3	3.8	3.6	4.6	3.7	3.4	5.0	3.4
MAX	5.4	5.3	5.[illegible]	7.3	5.9	6.6	6.4	6.4	5.0	5.1	4.3	4.6	4.3	4.9	4.9	5.9	4.8	[illegible]

KB DEIR ALT. 2-WAY ESSEX RUN 1 Hr AM PO7

EXA1ALT.DAT

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	1
20°	5.0	5.5	6.1	7.8	5.4	8.3	6.8	7.5	6.9	5.7	5.4	6.2	5.6	7.1	5.8	5.8	5.0	6
40°	5.3	5.4	6.4	7.8	5.5	9.2	5.6	7.3	7.9	6.7	5.4	6.0	5.6	6.6	5.8	5.8	5.1	6
60°	6.3	5.6	7.2	8.2	5.9	10.4	5.9	7.5	8.4	7.4	5.5	5.4	5.8	6.2	5.9	5.9	5.3	6
80°	6.9	7.2	8.8	10.8	7.7	10.3	6.0	8.2	7.9	7.7	5.8	5.2	6.2	6.0	6.6	6.1	5.5	6
100°	8.4	9.0	10.7	12.3	11.2	9.8	7.1	9.7	7.1	7.2	5.9	5.5	6.7	6.1	7.5	6.9	5.8	8
120°	7.6	8.1	9.1	10.0	11.6	8.3	7.9	10.2	7.0	7.2	6.2	5.9	6.5	5.7	7.5	7.9	6.1	7
140°	7.1	7.4	7.9	8.1	10.0	7.0	8.7	11.1	7.3	7.6	6.9	6.2	6.6	5.5	7.1	7.8	6.6	7
160°	6.8	6.9	7.4	7.5	8.7	6.7	9.5	11.7	6.7	7.5	7.3	6.8	7.4	5.9	8.1	7.4	6.9	7
180°	6.8	6.7	7.2	7.1	8.4	6.0	10.4	11.3	5.9	7.7	6.6	6.2	7.2	7.3	8.5	9.1	7.4	7
200°	7.0	6.7	7.0	7.0	8.0	5.7	12.1	9.6	5.7	7.5	5.8	5.9	6.2	9.0	7.1	10.0	8.1	7
220°	7.5	6.8	7.3	7.1	8.0	5.2	10.7	7.9	6.0	7.6	5.8	6.6	5.8	8.6	6.2	8.6	8.6	6
240°	8.3	7.3	7.9	8.2	8.8	5.1	9.0	8.1	7.1	8.0	5.8	7.6	5.8	7.9	6.2	7.1	7.6	7
260°	8.7	7.9	8.7	9.8	10.3	6.0	8.8	8.5	8.5	7.2	6.0	6.6	5.8	7.5	6.9	7.2	7.6	7
280°	6.8	6.5	7.2	9.5	9.8	8.2	7.7	6.6	8.1	5.6	5.8	6.0	5.7	7.1	6.6	6.9	6.9	7
300°	5.5	5.5	5.7	7.5	8.2	9.2	7.0	5.3	7.4	5.5	5.7	6.0	5.6	7.0	5.9	7.3	5.5	7
320°	5.5	5.3	5.4	8.1	6.6	8.8	7.1	5.4	7.1	5.5	5.5	5.9	5.6	7.2	5.6	6.9	5.1	7
340°	5.3	5.5	5.4	8.5	5.9	8.1	7.5	5.3	6.9	5.5	5.5	5.8	5.4	7.5	5.8	6.3	5.0	7
360°	5.1	5.6	5.6	8.5	5.4	7.7	8.0	6.0	6.9	5.6	5.4	5.9	5.5	7.3	5.9	5.9	5.0	6
MAX	8.7	9.0	10.7	12.3	11.6	10.4	12.1	11.7	8.5	8.0	7.3	7.6	7.4	9.0	8.5	10.0	8.6	8

Appendix D: Noise Prediction Analysis Worksheets

NAME Kingston / Bedford
DATE 12/29/93

PROJECT DESCRIPTION 1958 Existing
PM Peak Suburban Arterial

									A	MT	HT	A	MT	HT	A	MT	HT	A	MT	HT
1.	LANE NO./ROAD SEGMENT		N. BOUND			S. BOUND														
2.	VEHICLE CLAS.		A	MT	HT	A	MT	HT	A	MT	HT	A	MT	HT	A	MT	HT	A	MT	HT
3.	N(vph)		1340	–	30	1065	–	55												
4.	S(km/h)		50	–	50	50	–	50												
5.	D(m)			15			15													
6.	ϕ_1 (degrees)	Fig. 5		90			90													
7.	ϕ_2 (degrees)	Fig. 5		-90			-90													
8.	$(\overline{L}_o)_{E_i}$ (dBA)	Fig. 2	62	–	80	62	–	80												
9.	10 LOG $(N_i D_o / S_i)$ (dB)	Fig. 3	26	–	-1	25	–	2												
10a.	10 LOG (D_o/D) (dBA)	Fig. 4		0			0													
10b.	15 LOG (D_o/D) (dBA)	Fig. 4		–			–													
11a.	10 LOG $(\psi_b(\phi_1, \phi_2)/\pi)$ (dBA)	Fig. 6		–			–													
11b.	10 LOG $(\psi_{1/2}(\phi_1, \phi_2)/\pi)$ (dBA)	Fig. 7		–			–													
12.	ϕ_L (degrees)	Fig. 10		–			–													
13.	ϕ_R (degrees)	Fig. 10		–			–													
14.	δ_o (metres)	Fig. 9	88	–	79	87	–	82												
15.	N_o	Eq. 18	–	–	–	–	–	–												
16.	Δ_B (dBA)	Appendix B	–	–	–	–	–	–												
17.	CONSTANT (dB)		-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	25
18.	$L_{eq}(h)$ (dBA)		63	–	54	62	–	57												
19.	$L_{eq}(h)$ (dBA)			64			63													
20.	Δ_s (dBA)	Fig. 8																		
21.	$L_{eq}(h)$ (dBA)																			
22.	$L_{eq}(h)$ (dBA)																			
23.	ND/S (m/km)																			
24.	$(L_{10} - L_{eq})_i$ (dB)	Fig. 15																		
26.	$L_{10}(h)_i$ (dBA)																			
26.	$L_{10}(h)$ (dBA)																			
27	$L_{10}(h)$ (dBA)																			

Table (66) Noise Prediction Worksheet

NAME AINGSTON / BEDFORD
DATE 12/29/88

PROJECT DESCRIPTION 1993 NO BUILD PM PEAK
SURFACE ARTERY

			N. BOUND			S. BOUND									* N. BOUND			S. BOUND		
1.	LANE NO./ROAD SEGMENT		N. BOUND			S. BOUND									N. BOUND			S. BOUND		
2.	VEHICLE CLAS.		A	MT	HT	A	MT	HT	A	MT	HT	A	MT	HT	A	MT	HT	A	MT	HT
3.	N(vph)		1645	—	35	1290	—	85							1655	—	35	1390	—	85
4.	S(km/h)		50	—	50	50	—	50							50	—	50	50	—	50
5.	D(m)			15			15									15			15	
6.	ϕ_1 (degrees)	Fig. 5		90			90									90			90	
7.	ϕ_2 (degrees)	Fig. 5		-90			-90									-90			-90	
8.	$(\overline{L}_o)_{E_i}$ (dBA)	Fig. 2	62	—	80	62	—	80							62	—	50	62	—	80
9.	10 LOG $(N_i D_o / S_i)$ (dB)	Fig. 3	27	—	0	25	—	14							27	—	0	25	—	15
10a.	10 LOG (D_o/D) (dBA)	Fig. 4		0			0									0			0	
10b.	15 LOG (D_o/D) (dBA)	Fig. 4		—			—									—			—	
11a.	10 LOG $(\psi_0(\phi_1, \phi_2)/\pi)$ (dBA)	Fig. 6		—			—									—			—	
11b.	10 LOG $(\psi_{1/2}(\phi_1, \phi_2)/\pi)$ (dBA)	Fig. 7		—			—									—			—	
12.	ϕ_L (degrees)	Fig. 10		—			—									—			—	
13.	ϕ_R (degrees)	Fig. 10		—			—									—			—	
14.	δ_o (metres)	Fig. 9	89	—	80	87	—	94							89	—	80	87	—	95
15.	N_o	Eq. 18	—	—	—	—	—	—							—	—	—	—	—	—
16.	Δ_B (dBA)	Appendix B	—	—	—	—	—	—							—	—	—	—	—	—
17.	CONSTANT (dB)		-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25
18.	$L_{eq}(h)$ (dBA)		64	—	55	62	-	69							64	—	55	62	—	70
19.	$L_{eq}(h)$ (dBA)			64			70									64			71	
20.	Δ_s (dBA)	Fig. 8																		
21.	$L_{eq}(h)$ (dBA)																			
22.	$L_{eq}(h)$ (dBA)																			
23.	ND/S (m/km)																			
24.	$(L_{10} - L_{eq})_i$ (dB)	Fig. 15																		
25.	$L_{10}(h)_i$ (dBA)																			
26.	$L_{10}(h)$ (dBA)																			
27.	$L_{10}(h)$ (dBA)																			

* NEW FOSEA STREET (2-WAY)

Table (71) Noise Prediction Worksheet

NAME KINGSTON/BEDFORD
DATE 12/30/88

PROJECT DESCRIPTION 1993 Alternative 2 PM PEAK
SURFACE ARTERY

No.	Item	Ref.	N. BOUND			S. BOUND									N. BOUND *			S. BOUND		
2.	VEHICLE CLAS.		A	MT	HT	A	MT	HT	A	MT	HT	A	MT	HT	A	MT	HT	A	MT	HT
3.	N(vph)		1665	–	35	1260	–	80							1675	–	35	1375	–	85
4.	S(km/h)		50	–	50	50	–	50							50	–	50	50	–	50
5.	D(m)			15			15									15			15	
6.	ϕ_1 (degrees)	Fig. 5		90			90									90			90	
7.	ϕ_2 (degrees)	Fig. 5		-90			-90									-90			-90	
8.	$(\bar{L}_o)E_i$ (dBA)	Fig. 2	62	–	80	62	–	80							62	–	80	62	–	80
9.	10 LOG (N_iD_o/S_i) (dB)	Fig. 3	27	–	0	25	–	14							27	–	0	25	–	15
10a.	10 LOG (D_o/D) (dBA)	Fig. 4		0			0									0			0	
10b.	15 LOG (D_o/D) (dBA)	Fig. 4		–			–									–			–	
11a.	10 LOG $(\psi_b(\phi_1, \phi_2)/\pi)$ (dBA)	Fig. 6		–			–									–			–	
11b.	10 LOG $(\psi_{1/2}(\phi_1, \phi_2)/\pi)$ (dBA)	Fig. 7		–			–									–			–	
12.	ϕ_L (degrees)	Fig. 10		–			–									–			–	
13.	ϕ_R (degrees)	Fig. 10		–			–									–			–	
14.	δ_o (metres)	Fig. 9	89	–	80	87	–	94							89	–	80	87	–	95
15.	N_o	Eq. 18	–	–	–	–	–	–							–	–	–	–	–	–
16.	Δ_B (dBA)	Appendix B	–	–	–	–	–	–							–	–	–	–	–	–
17.	CONSTANT (dB)		-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25
18.	$L_{eq}(h)$ (dBA)		64	–	55	62	–	69							64	–	55	62	–	70
19.	$L_{eq}(h)$ (dBA)			64			70									64			71	
20.	Δ_s (dBA)	Fig. 8																		
21.	$L_{eq}(h)$ (dBA)																			
22.	$L_{eq}(h)$ (dBA)																			
23.	ND/S (m/km)																			
24.	$(L_{10} - L_{eq})_i$ (dB)	Fig. 15																		
25.	$L_{10}(h)_i$ (dBA)																			
26.	$L_{10}(h)$ (dBA)																			
27.	$L_{10}(h)$ (dBA)																			

Row 1. LANE NO./ROAD SEGMENT

* NEW ESSEX ST. (2-WAY)

Table (71) Noise Prediction Worksheet (72)

NAME [illegible]STON / BEDFORD

DATE 12/30/88

PROJECT DESCRIPTION 1993 AUT 6 PM PEAK

SURFACE ARTERY

															*					
1.	LANE NO./ROAD SEGMENT		N. BOUND			S. BOUND									N. BOUND			BOUND		
2.	VEHICLE CLAS.		A	MT	HT	A	MT	HT	A	MT	HT	A	MT	HT	A	MT	HT	A	MT	HT
3.	N(vph)		1645	–	35	1260	–	80							1665	–	35	1390	–	85
4.	S(km/h)		50	–	50	50	–	50							50	–	50	50	–	50
5.	D(m)			15			15									15			15	
6.	ϕ_1 (degrees)	Fig. 5		90			90									90			90	
7.	ϕ_2 (degrees)	Fig. 5		-90			-90									-90			-90	
8.	$(\overline{L_o})E_i$ (dBA)	Fig. 2	62	–	80	62	–	80							62	–	80	62	–	80
9.	10 LOG (N_iD_o/S_i) (dB)	Fig. 3	27	–	0	25	–	14							27	–	0	25	–	15
10a.	10 LOG (D_o/D) (dBA)	Fig. 4		0			0									0			0	
10b.	15 LOG (D_o/D) (dBA)	Fig. 4		–			–									–			–	
11a.	10 LOG $(\psi_b(\phi_1, \phi_2)/\pi)$ (dBA)	Fig. 6		–			–									–			–	
11b.	10 LOG $(\psi_{1/2}(\phi_1, \phi_2)/\pi)$ (dBA)	Fig. 7		–			–									–			–	
12.	ϕ_L (degrees)	Fig. 10		–			–									–			–	
13.	ϕ_R (degrees)	Fig. 10		–			–									–			–	
14.	δ_o (metres)	Fig. 9	89	–	80	81	–	94							89	–	80	87	–	95
15.	N_o	Eq. 18	–	–	–	–	–	–							–	–	–	–	–	–
16.	Δ_B (dBA)	Appendix B	–	–	–	–	–	–							–	–	–	–	–	–
17.	CONSTANT (dB)		-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	[illegible]
18.	$L_{eq}(h)$ (dBA)		64	–	55	62	–	69							64	–	55	62	–	70
19.	$L_{eq}(h)$ (dBA)			64			70									64			71	
20.	Δ_s (dBA)	Fig. 8																		
21.	$L_{eq}(h)$ (dBA)																			
22.	$L_{eq}(h)$ (dBA)																			
23.	ND/S (m/km)																			
24.	$(L_{10}-L_{eq})_i$ (dB)	Fig. 15																		
25.	$L_{10}(h)_i$ (dBA)																			
26.	$L_{10}(h)$ (dBA)																			
27.	$L_{10}(h)$ (dBA)																			

* NEW ESSEX STREET (2-WAY)

Table (71) Noise Prediction Worksheet

NAME LIVINGSTON/BEDFORD
DATE 12/29/88

PROJECT DESCRIPTION 1988 EXISTING
PM PEAK ESSEX

			EAST BOUND																	
1.	LANE NO./ROAD SEGMENT																			
2.	VEHICLE CLAS.		A	MT	HT	A	MT	HT	A	MT	HT	A	MT	HT	A	MT	HT	A	MT	HT
3.	N(vph)		930	–	20															
4.	S(km/h)		50	–	50															
5.	D(m) DEFAULT			15																
6.	ϕ_1 (degrees)	Fig. 5		90																
7.	ϕ_2 (degrees)	Fig. 5		-90																
8.	$(\overline{L}_o)_{E_i}$ (dBA)	Fig. 2	62	–	80															
9.	10 LOG $(N_i D_o/S_i)$ (dB)	Fig. 3	25	–	-2															
10a.	10 LOG (D_o/D) (dBA)	Fig. 4		0																
10b.	15 LOG (D_o/D) (dBA)	Fig. 4		–																
11a.	10 LOG $(\psi_0(\phi_1, \phi_2)/\pi)$ (dBA)	Fig. 6		–																
11b.	10 LOG $(\psi_{1/2}(\phi_1, \phi_2)/\pi)$ (dBA)	Fig. 7		–																
12.	ϕ_L (degrees)	Fig. 10		–																
13	ϕ_R (degrees)	Fig. 10		–																
14.	δ_o (metres)	Fig. 9	87	–	78															
15	N_o	Eq. 18	–	–	–															
16.	Δ_B (dBA)	Appendix B	–	–	–															
17.	CONSTANT (dB)		-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-2[illegible]	-2[illegible]
18.	$L_{eq}(h)$ (dBA)		62	–	53															
19.	$L_{eq}(h)$ (dBA)			62																
20	Δ_s (dBA)	Fig. 8																		
21.	$L_{eq}(h)$ (dBA)																			
22.	$L_{eq}(h)$ (dBA)																			
23.	ND/S (m/km)																			
24	$(L_{10} - L_{eq})_i$ (dB)	Fig. 15																		
25	$L_{10}(h)_i$ (dBA)																			
26	$L_{10}(h)$ (dBA)																			
27	$L_{10}(h)$ (dBA)																			

Table Noise Prediction Worksheet

NAME KINGSTON / BEDFORD PROJECT DESCRIPTION 1993 NO BUILD PM PEAK

DATE 12/29/88 ESSEX

			EASTBOUND											*	EAST BOUND			WEST BOUND		
1.	LANE NO./ROAD SEGMENT																			
2.	VEHICLE CLAS.		A	MT	HT	A	MT	HT	A	MT	HT	A	MT	HT	A	MT	HT	A	MT	HT
3.	N(vph)		1525	—	30										1525	—	30	445	—	10
4.	S(km/h)		50	—	50										50	—	50	50	—	50
5.	D(m)			15												15			15	
6.	ϕ_1 (degrees)	Fig. 5		90												90			90	
7.	ϕ_2 (degrees)	Fig. 5		-90												-90			-90	
8.	$(\bar{L}_o)_{E_i}$ (dBA)	Fig. 2	62	—	80										62	-	80	62	—	80
9.	10 LOG $(N_i D_o / S_i)$ (dB)	Fig. 3	27	—	-1										25	—	-1	21	—	-5
10a.	10 LOG (D_o/D) (dBA)	Fig. 4		0												0			0	
10b.	15 LOG (D_o/D) (dBA)	Fig. 4		—												—			—	
11a.	10 LOG $(\psi_o(\phi_1, \phi_2)/\pi)$ (dBA)	Fig. 6		—												—			—	
11b.	10 LOG $(\psi_{1/2}(\phi_1, \phi_2)/\pi)$ (dBA)	Fig. 7		—												—			—	
12.	ϕ_L (degrees)	Fig. 10		—												—			—	
13.	ϕ_R (degrees)	Fig. 10		—												—			—	
14.	δ_o (metres)	Fig. 9	89	—	79										89	—	79	83	—	75
15.	N_o	Eq. 18	—	—	—										—	—	—	—	—	—
16.	Δ_B (dBA)	Appendix B	—	—	—										—	—	—	—	—	—
17.	CONSTANT (dB)		-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25
18.	$L_{eq}(h)$ (dBA)		64	—	54										64	—	54	58	—	50
19.	$L_{eq}(h)$ (dBA)			64												64			59	
20	Δ_s (dBA)	Fig. 8																		
21.	$L_{eq}(h)$ (dBA)																			
22.	$L_{eq}(h)$ (dBA)																			
23	ND/S (m/km)																			
24.	$(L_{10} - L_{eq})_i$ (dB)	Fig 15																		
25.	$L_{10}(h)_i$ (dBA)																			
26	$L_{10}(h)$ (dBA)																			
27	$L_{10}(h)$ (dBA)																			

* NEW ESSEX ST. (2-WAY

64 65

Table Noise Prediction Worksheet

NAME KINGSTON / BEDFORD
DATE 12/29/88

PROJECT DESCRIPTION 1993 Alternative ... AM PEAK
ESSEX

			ESSEX												* ESSEX					
1.	LANE NO./ROAD SEGMENT		1												EAST BOUND			WEST BOUND		
2.	VEHICLE CLAS.		A	MT	HT	A	MT	HT	A	MT	HT	A	MT	HT	A	MT	HT	A	MT	HT
3.	N(vph)		1625	–	35										1625	–	35	490	–	10
4.	S(km/h)		50	–	50										50	–	50	50	–	50
5.	D(m)			15												15			15	
6.	ϕ_1 (degrees)	Fig. 5		90												90			90	
7.	ϕ_2 (degrees)	Fig. 5		-90												-90			-90	
8.	$(\overline{L}_o)_{E_i}$ (dBA)	Fig. 2	62	–	80										62	–	80	62	–	80
9.	10 LOG $(N_i D_o / S_i)$ (dB)	Fig. 3	27	–	0										27	–	0	22	–	-5
10a.	10 LOG (D_o/D) (dBA)	Fig. 4		0												0			0	
10b.	15 LOG (D_o/D) (dBA)	Fig. 4		–												–			–	
11a.	10 LOG $(\psi_0(\phi_1, \phi_2)/\pi)$ (dBA)	Fig. 6		–												–			–	
11b.	10 LOG $(\psi_{1/2}(\phi_1, \phi_2)/\pi)$ (dBA)	Fig. 7		–												–			–	
12.	ϕ_L (degrees)	Fig. 10		–												–			–	
13.	ϕ_R (degrees)	Fig. 10		–												–			–	
14.	δ_o (metres)	Fig. 9	89	–	80										89	–	80	84	–	75
15.	N_o	Eq. 18	–	–	–										–	–	–	–	–	–
16.	Δ_B (dBA)	Appendix B	–	–	–										–	–	–	–	–	–
17.	CONSTANT (dB)		-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25
18.	$L_{eq}(h)$ (dBA)		64	–	55										64	–	55	59	–	50
19.	$L_{eq}(h)$ (dBA)			64												64			60	
20.	Δ_s (dBA)	Fig. 8																		
21.	$L_{eq}(h)$ (dBA)																			
22.	$L_{eq}(h)$ (dBA)																			
23.	ND/S (m/km)																			
24.	$(L_{10}-L_{eq})_i$ (dB)	Fig. 15																		
25.	$L_{10}(h)_i$ (dBA)																			
26.	$L_{10}(h)$ (dBA)																			
27.	$L_{10}(h)$ (dBA)																			

(64) (65)

Table Noise Prediction Worksheet

* NEW ESSEX STREET (2-WAY)

NAME KINGSTON / BEDFORD
DATE 12/29/98

PROJECT DESCRIPTION 1993 AVTV PM PEAK
ESSEX

*1

1.	LANE NO./ROAD SEGMENT		E. BOUND												E. BOUND			W. BOUND		
2.	VEHICLE CLAS.		A	MT	HT	A	MT	HT	A	MT	HT	A	MT	HT	A	MT	HT	A	MT	HT
3.	N(vph)		1660	—	30										1660	—	30	450	—	10
4.	S(km/h)		50	—	50										50	—	50	50	—	50
5.	D(m)			15												15			15	
6.	ϕ_1 (degrees)	Fig. 5		90												90			90	
7.	ϕ_2 (degrees)	Fig. 5		-90												-90			-90	
8.	$(\overline{L}_o)_{E_i}$ (dBA)	Fig. 2	62	—	80										62	—	80	62	—	80
9.	10 LOG $(N_i D_o / S_i)$ (dB)	Fig. 3	27	—	-1										27	—	-1	22	—	-5
10a.	10 LOG (D_o/D) (dBA)	Fig. 4		0												0			0	
10b.	15 LOG (D_o/D) (dBA)	Fig. 4		—												—			—	
11a.	10 LOG $(\psi_0(\phi_1, \phi_2)/\pi)$ (dBA)	Fig. 6		—												—			—	
11b.	10 LOG $(\psi_{1/2}(\phi_1, \phi_2)/\pi)$ (dBA)	Fig. 7		—												—			—	
12.	ϕ_L (degrees)	Fig. 10		—												—			—	
13.	ϕ_R (degrees)	Fig. 10		—												—			—	
14.	δ_o (metres)	Fig. 9	89	—	79										89	—	79	84	—	75
15.	N_o	Eq. 18	—	—	—										—	—	—	—	—	—
16.	Δ_B (dBA)	Appendix B	—	—	—										—	—	—	—	—	—
17.	CONSTANT (dB)		-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25
18.	$L_{eq}(h)$ (dBA)		64	—	54										64	—	54	59	—	50
19.	$L_{eq}(h)$ (dBA)			64												64			60	
20.	Δ_s (dBA)	Fig. 8																		
21.	$L_{eq}(h)$ (dBA)																			
22.	$L_{eq}(h)$ (dBA)																			
23.	ND/S (m/km)																			
24.	$(L_{10}-L_{eq})_i$ (dB)	Fig. 15																		
25.	$L_{10}(h)_i$ (dBA)																			
26.	$L_{10}(h)$ (dBA)																			
27.	$L_{10}(h)$ (dBA)																			

*NEW ESSEX ST. (2-WAY)

(6.4) (6.5)

Table _ Noise Prediction Worksheet

Appendix E: Wind Impact Information

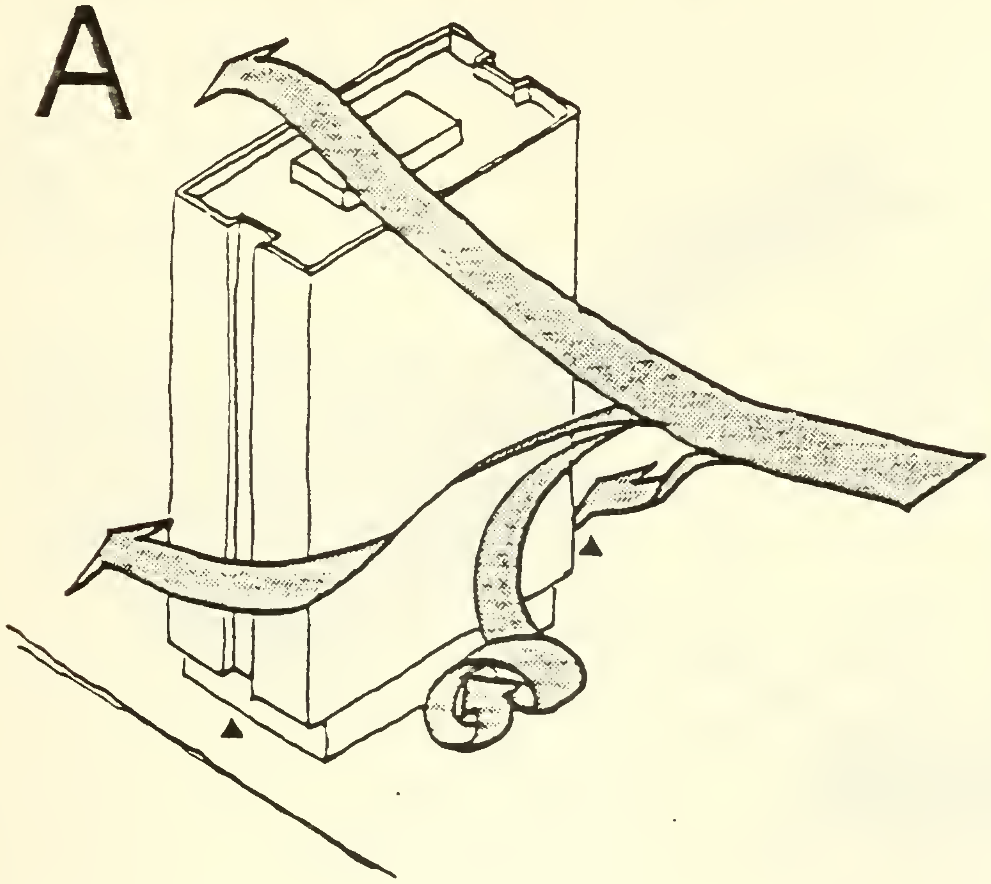
1. Wind Problem Characteristics
2. Wind Control Solutions for Existing Problems
3. Building Mass Concepts for Wind Control

APPENDIX E-1

WIND PROBLEM CHARACTERISTICS

PROBLEMS

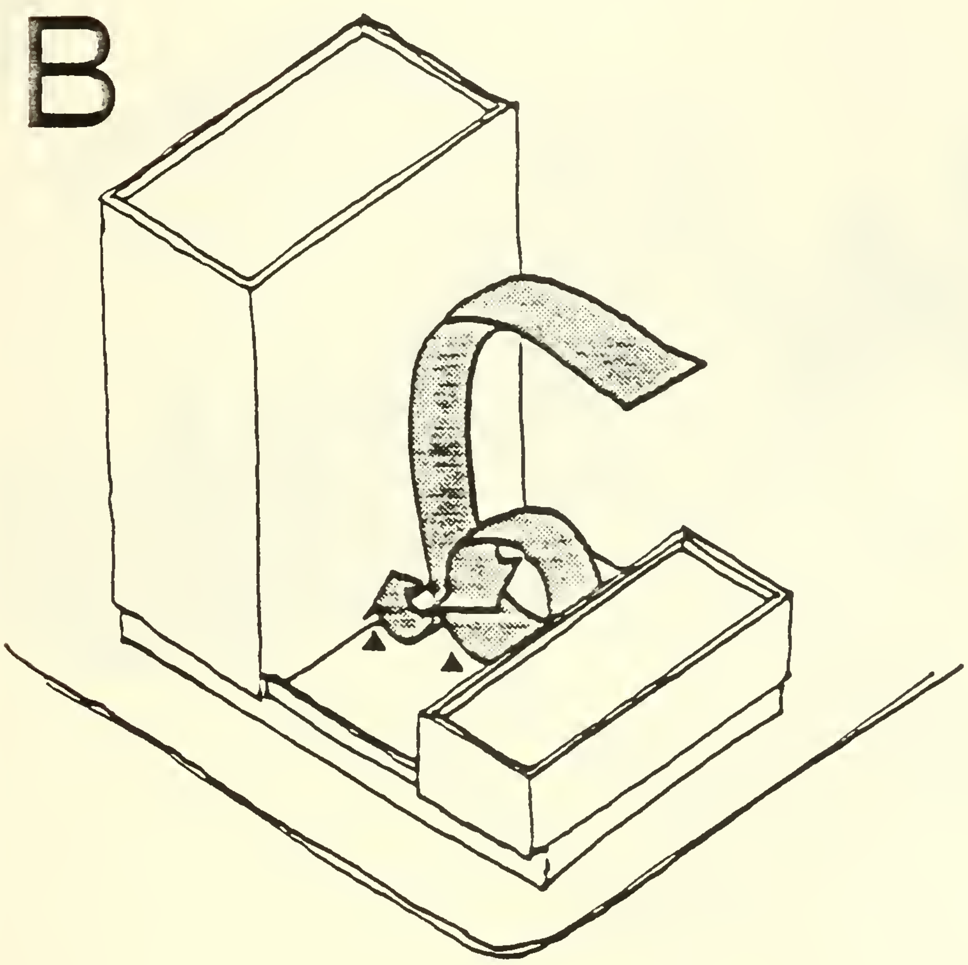
A



PROBLEM: STRONG UPPER LEVEL WINDS IMPINGE ON THE BUILDING FACE, DEFLECT DOWNWARDS AND ACCELERATE AROUND THE CORNERS OF THE BUILDING.

SOLUTIONS: 1, 3, 1 AND 3, OR 2 AND 3.

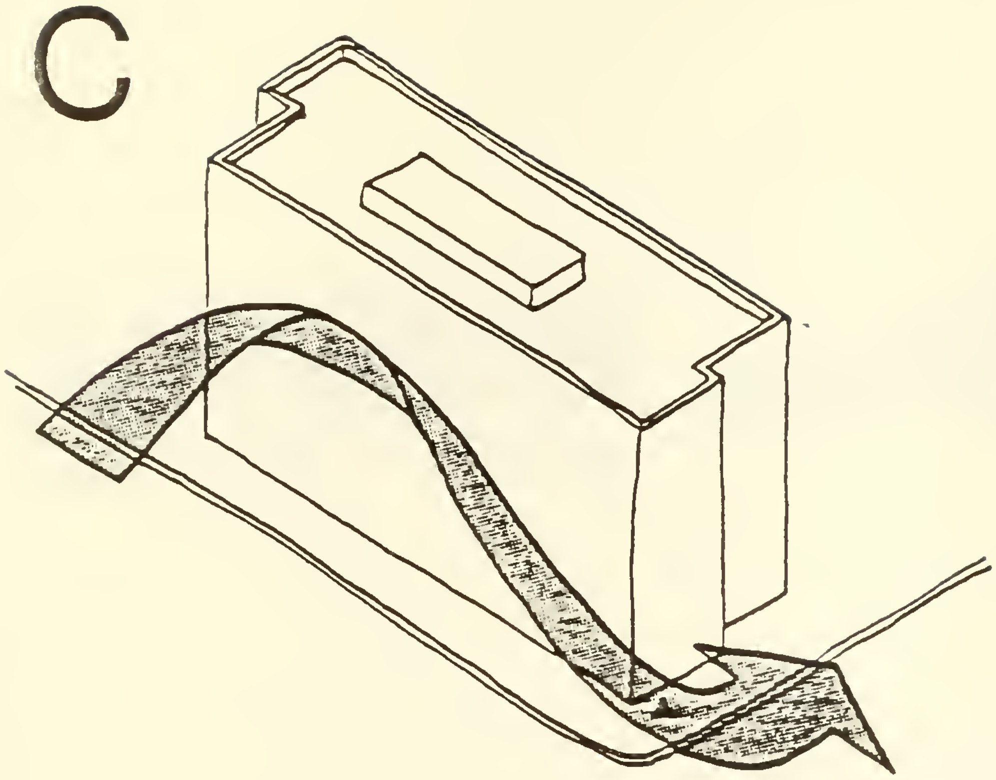
B



PROBLEM: LOCATING A LOW RISE BUILDING UPSTREAM OF A HIGH RISE CAN CAUSE MORE WIND TO BE DEFLECTED DOWN THE FACE OF THE BUILDING.

SOLUTIONS: 1, 3, 1 AND 3, OR 2 AND 3.

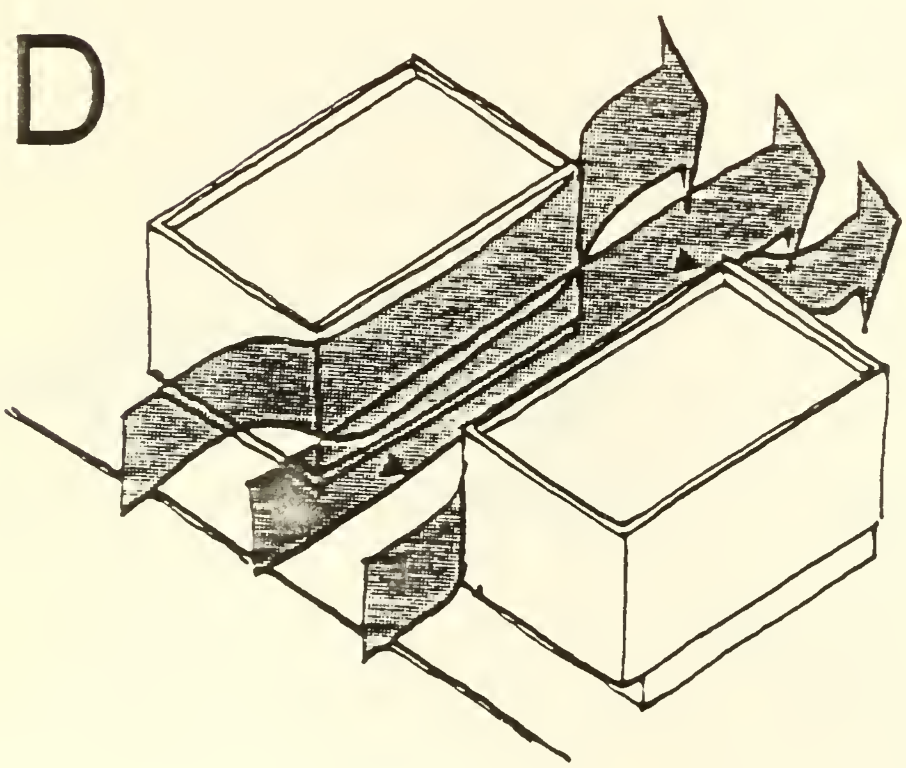
C



PROBLEM: WIND FLOWING AT AN ANGLE TO A LONG (AND TALL) BUILDING WILL BE CONCENTRATED AT THE DOWNWIND CORNER OF THE BUILDING. THE LONGER THE BUILDING, THE GREATER THE INCREASE IN PEDESTRIAN LEVEL WIND SPEED.

SOLUTIONS: 1, 1 AND 2, 1 AND 3, OR 2 AND 3.

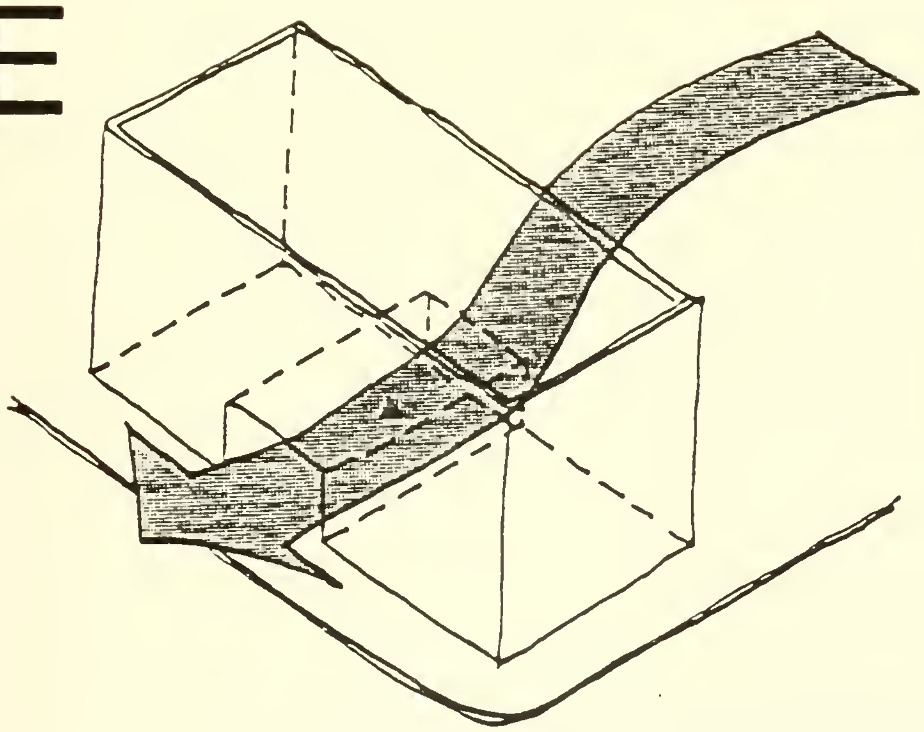
D



PROBLEM: THIS CREATES A VERY SEVERE PEDESTRIAN LEVEL WIND CONDITION. WIND CAN ALSO BE FUNNELED BY RELATIVELY LOW BUILDINGS.

SOLUTIONS: 1, 2, OR 1 AND 2.

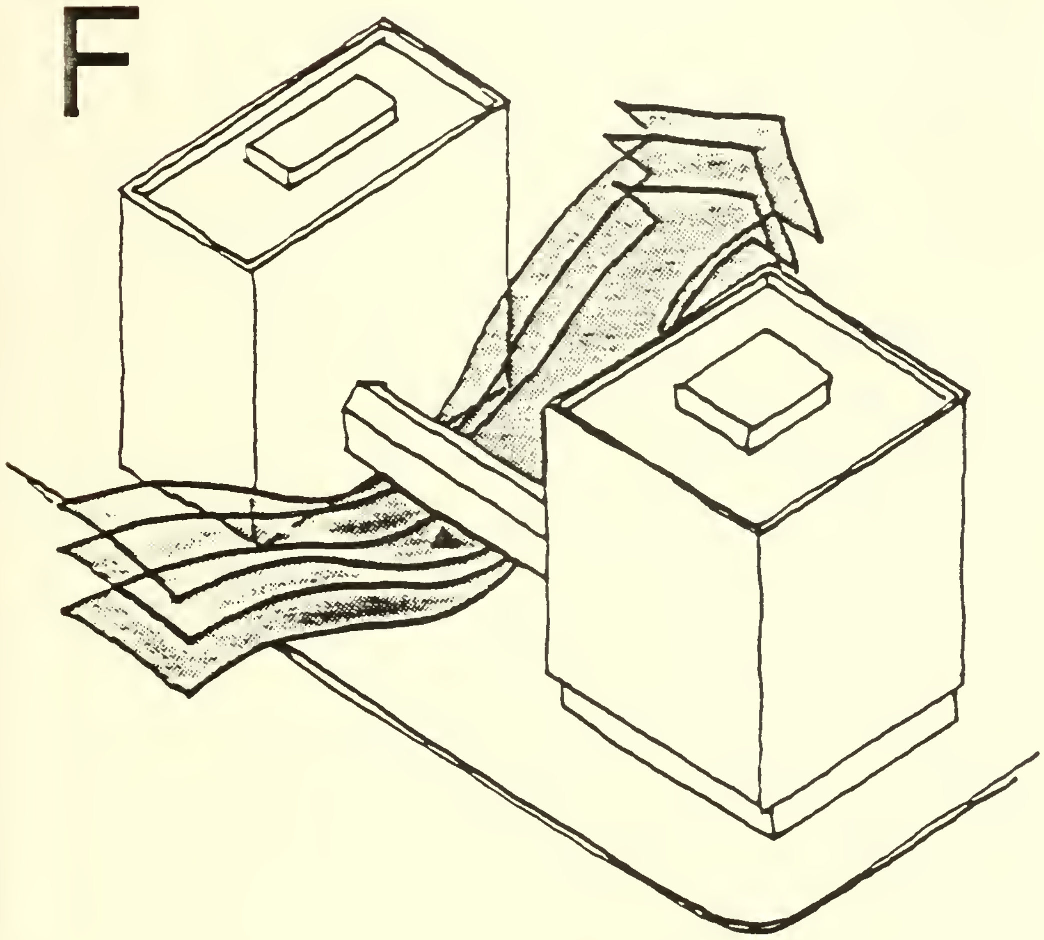
E



PROBLEM: AN OPEN PASSAGEWAY THROUGH A TALL BUILDING CREATES AN UNCOMFORTABLE CONDITION IN THE PASSAGEWAY AND REDUCES THE SHELTERED CONDITION BEHIND THE BUILDING. THIS EFFECT IS MAGNIFIED AS THE HEIGHT OF THE BUILDING IS INCREASED.

SOLUTIONS: 2, 3, OR 2 AND 3.

F



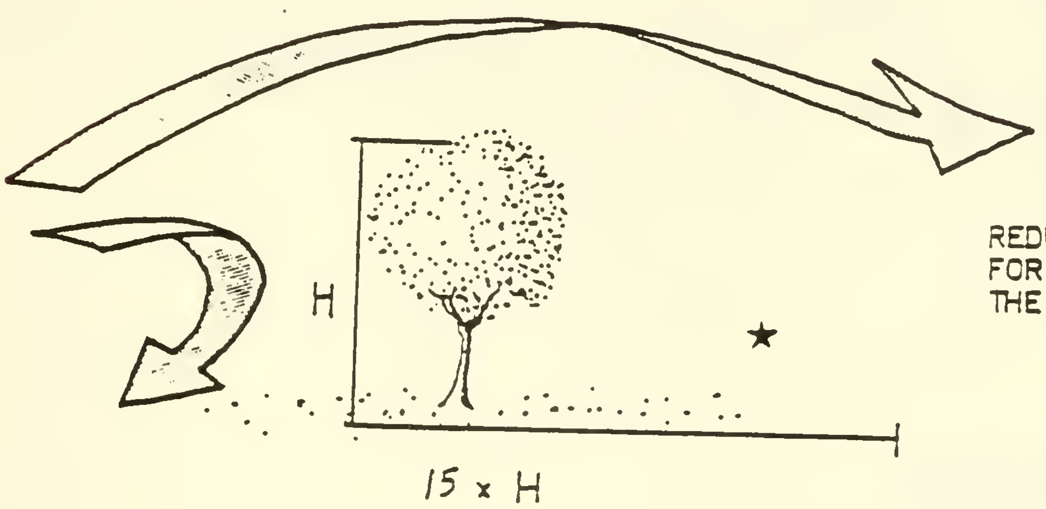
PROBLEM: ELEVATED WALKWAYS CAN FURTHER INCREASE ALREADY ACCELERATED WIND FLOWS.

SOLUTIONS: 1, 2, OR 1 AND 2.

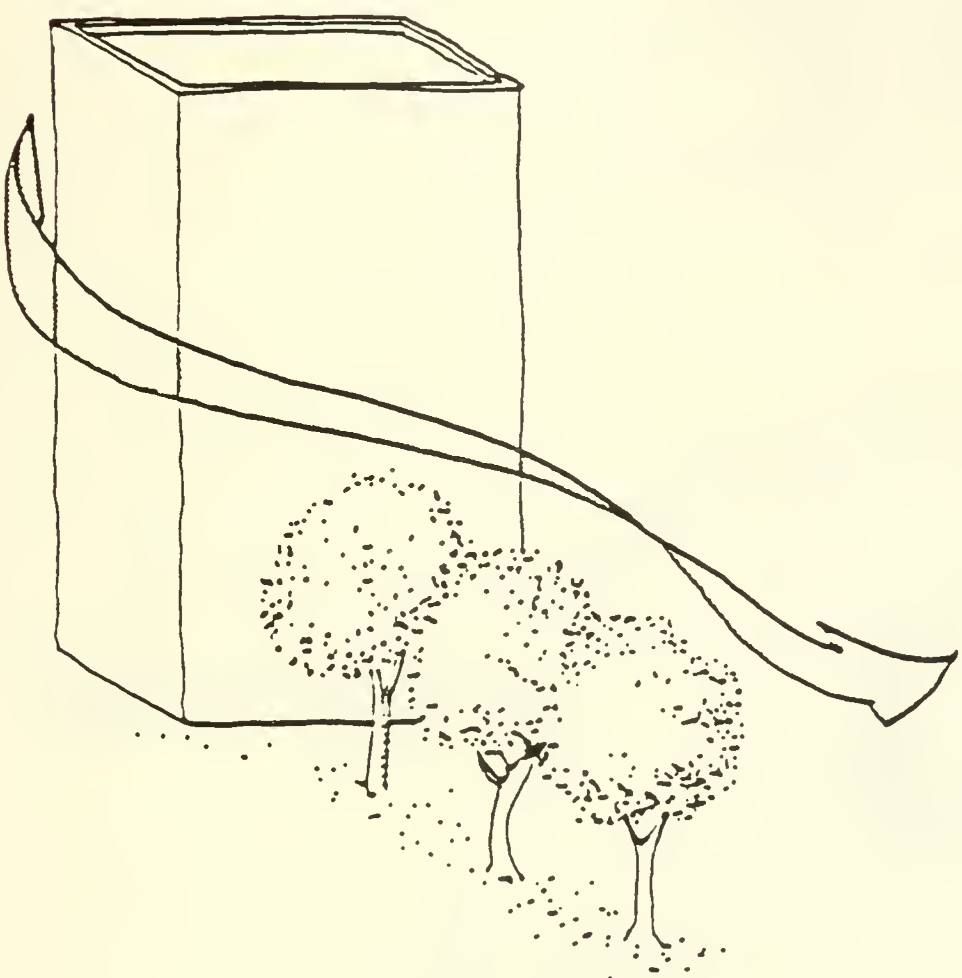
APPENDIX E-2

WIND CONTROL SOLUTIONS FOR EXISTING PROBLEMS

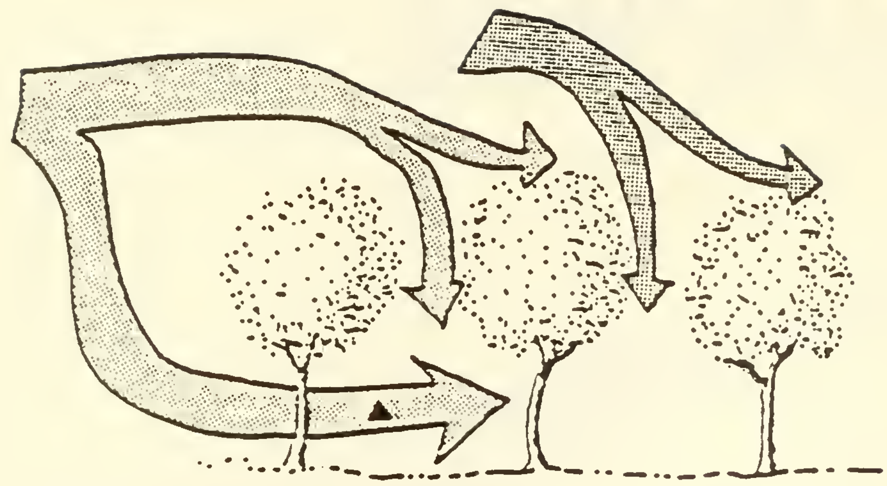
1. LANDSCAPING



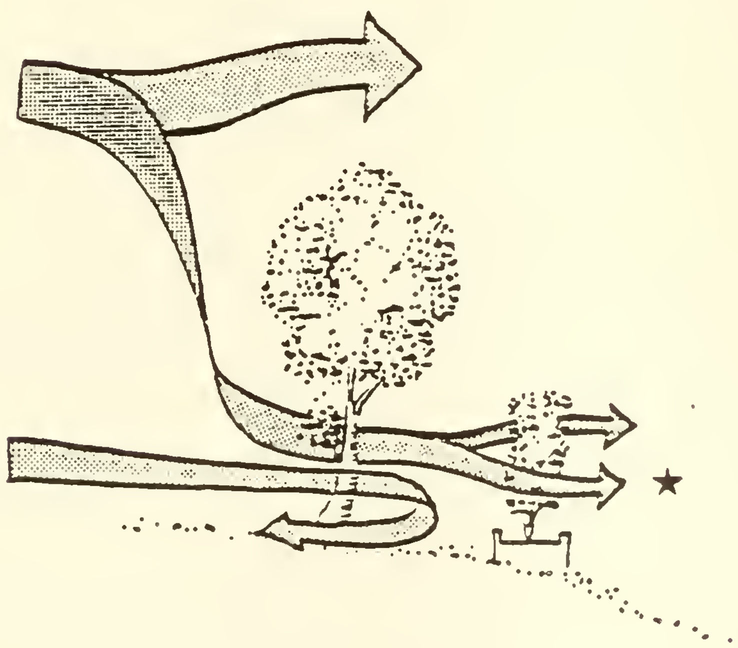
REDUCED VELOCITY AREA EXISTS FOR APPROXIMATELY 15 TIMES THE HEIGHT (H) OF THE TREES.



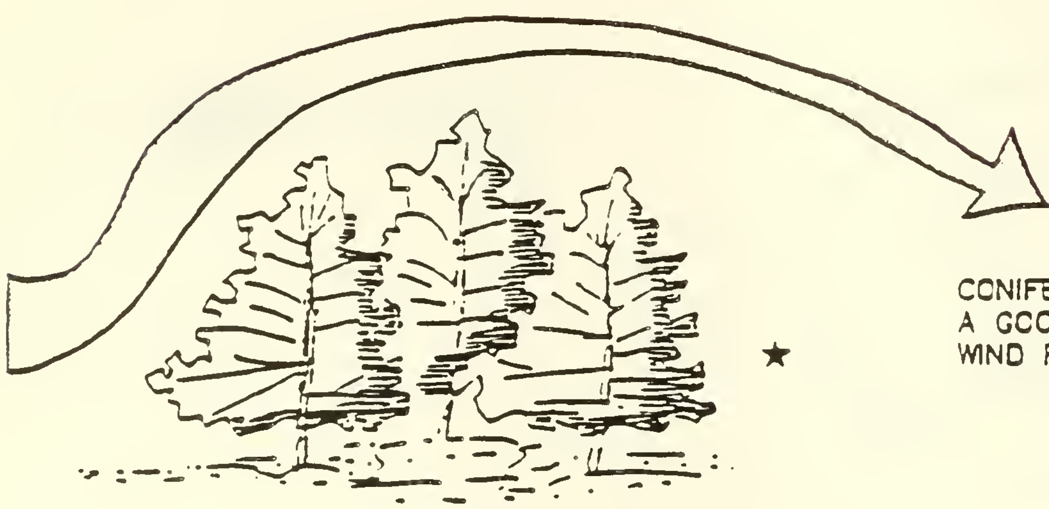
DOWNWASH FROM A BUILDING CAN SHORTEN THIS PROTECTED AREA.



DECIDUOUS TREES OFTEN DO NOT PROVIDE GROUND LEVEL PROTECTION, ONLY PROVIDE PROTECTION DURING THE SUMMER MONTHS, AND ARE GOOD FOR FORMING CANOPIES TO REDUCE DOWNWASH WIND FLOWS.

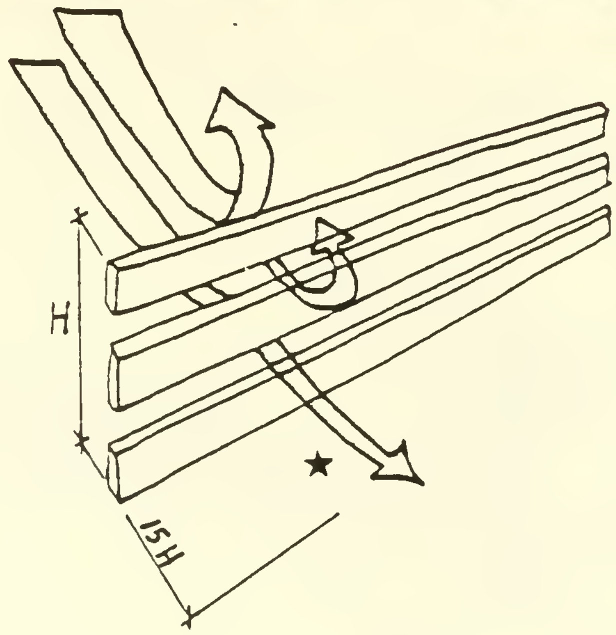


UNDERPLANTING WILL ASSIST DECIDUOUS TREES IN PROVIDING GROUND LEVEL PROTECTION.

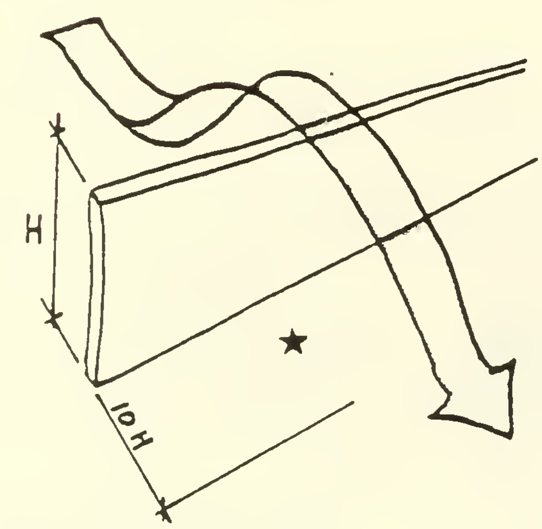


CONIFEROUS TREES ARE CONSIDERED A GOOD ALTERNATIVE FOR WINTER WIND PROTECTION.

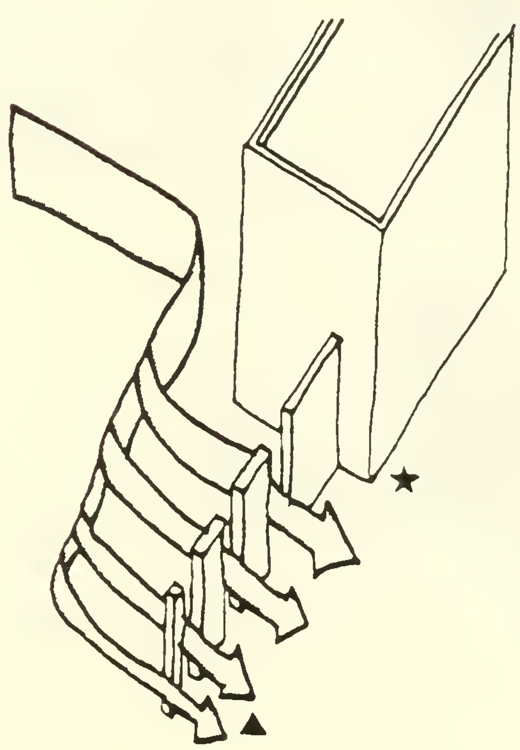
2. WINDSCREENS



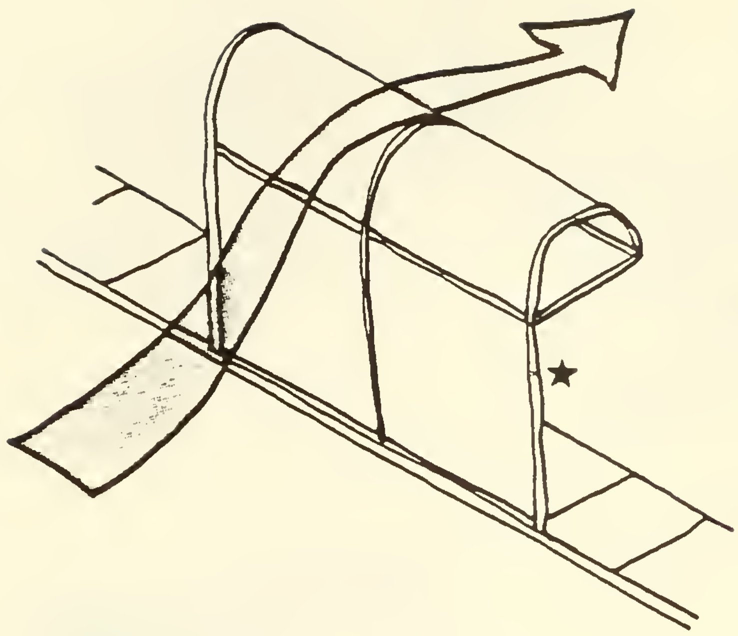
A 50% POROUS SCREEN PRODUCES A REDUCED VELOCITY AREA FOR 15 TIMES THE HEIGHT (H) OF THE SCREEN.



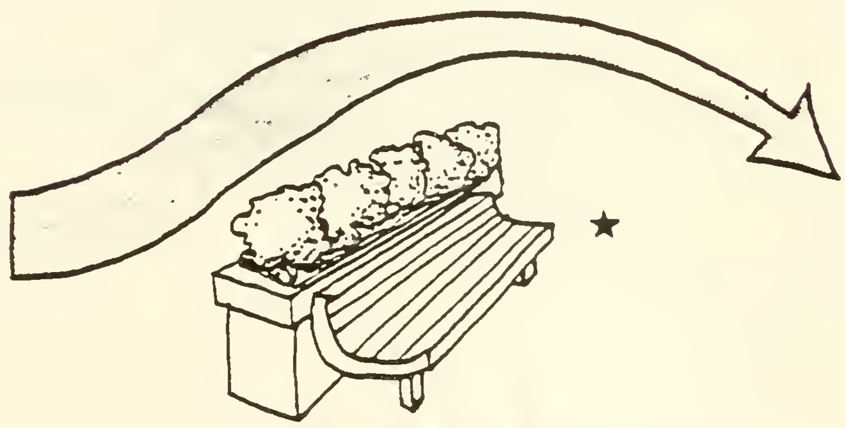
A SOLID FENCE PRODUCES A REDUCED VELOCITY AREA FOR 10 TIMES THE HEIGHT (H) OF THE FENCE.



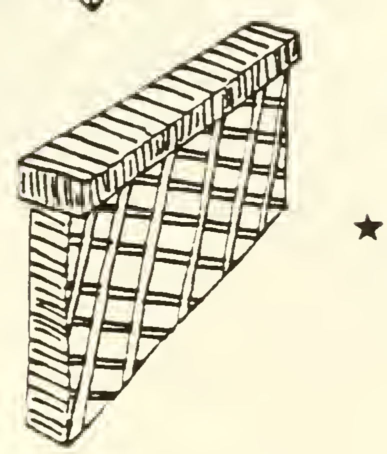
IF A WINDY AREA IS UNAVOIDABLE, INTRODUCE PEDESTRIANS TO THE HIGH WIND SPEED AREA GRADUALLY.
FOR EXAMPLE, BAFFLES COULD BE USED TO BREAK UP THE WIND.



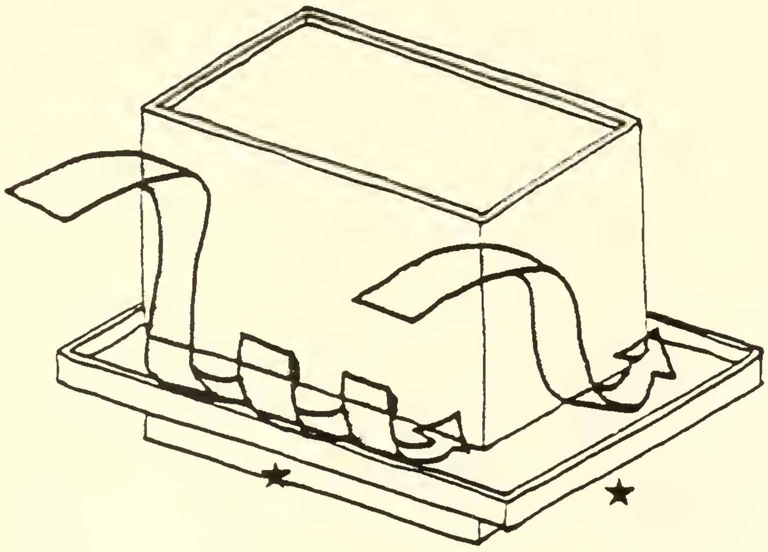
PARTIALLY ENCLOSED WALKWAYS MUST BE ORIENTED CONSIDERING THE PREVAILING WIND DIRECTIONS.



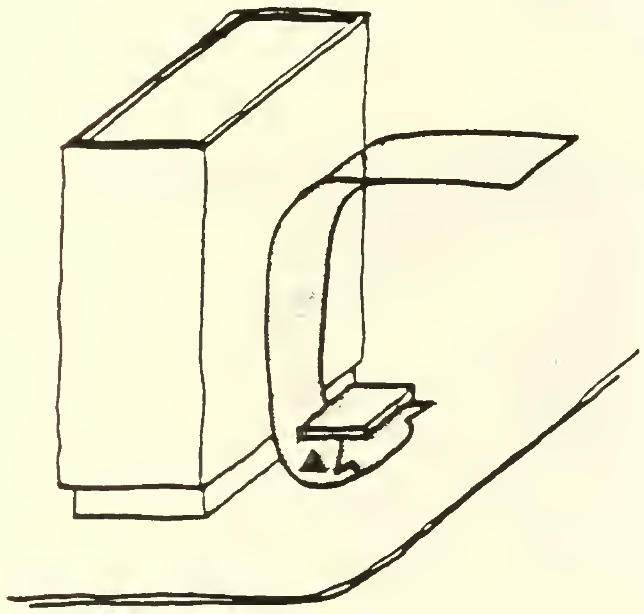
SMALL SCALE FEATURES SUCH AS BENCHES, PLANTERS, AND LATTICES SHOULD BE PLACED TO SHELTER PEDESTRIANS FROM ADVERSE WIND CONDITIONS.



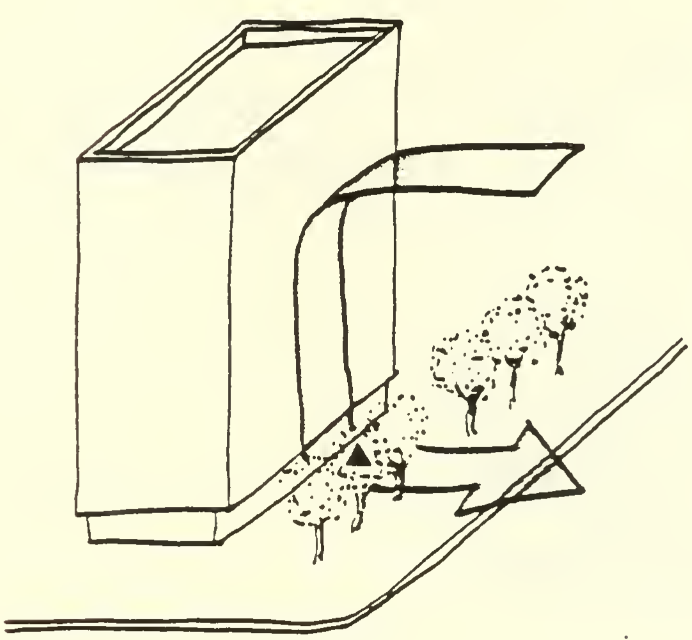
3. CANOPIES



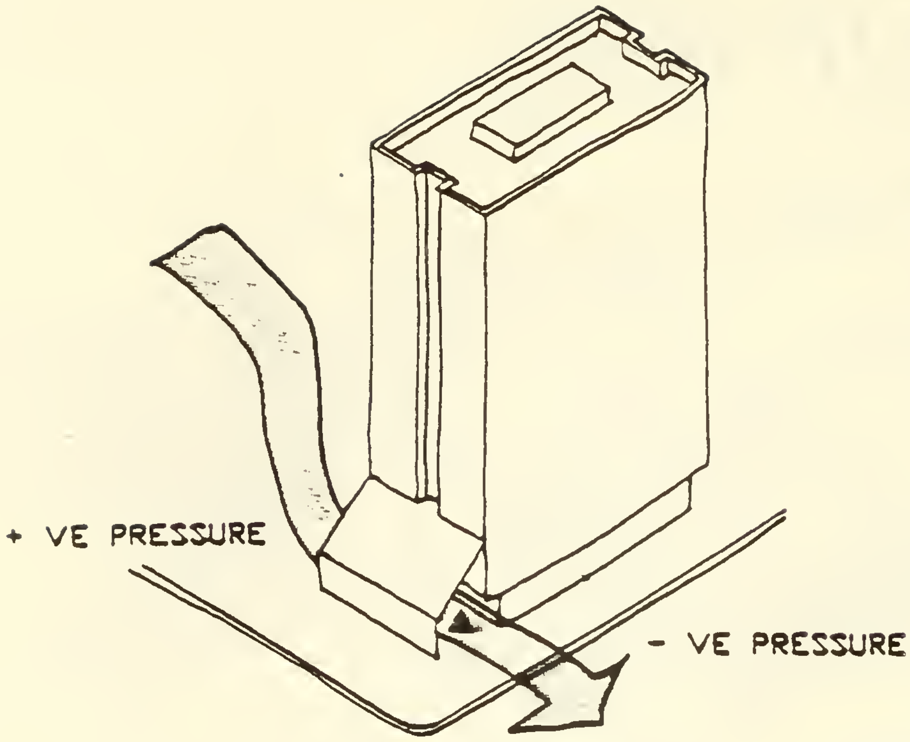
CANOPIES ARE BENEFICAL ON THE WINDWARD FACE AND SHOULD BE CONTINUED AROUND THE BUILDING. PARAPET WALLS WILL MAKE THE CANOPY MORE EFFECTIVE.



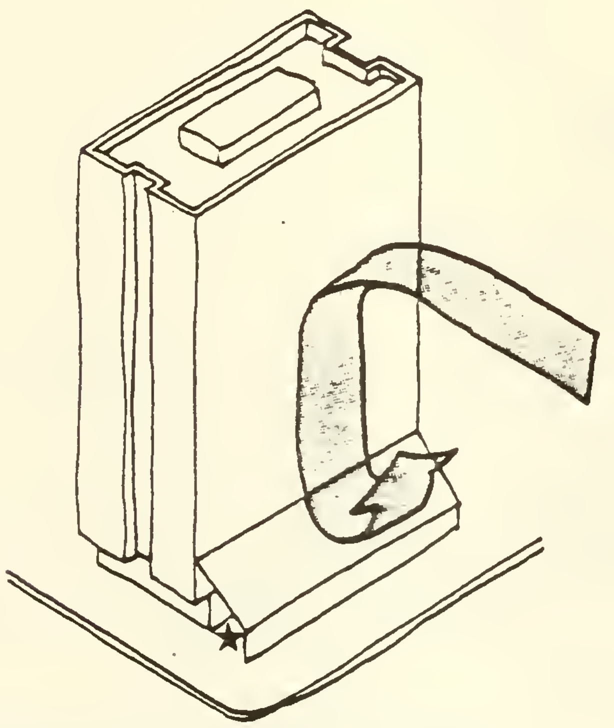
A CANOPY WHICH IS NOT TOUCHING A BUILDING IS INEFFECTIVE.



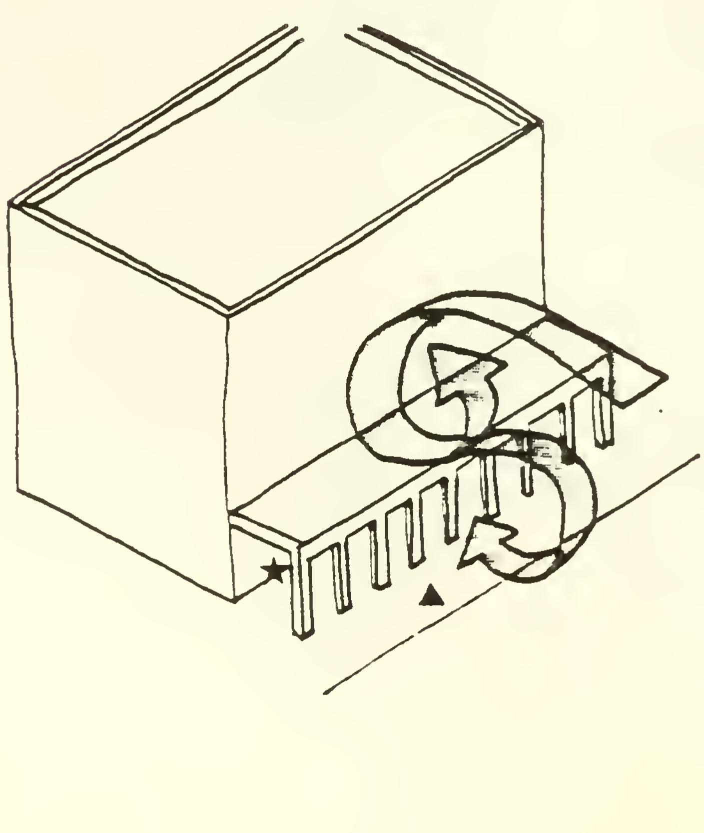
LANDSCAPING WHICH IS NOT TOUCHING A BUILDING IS ALSO INEFFECTIVE.



ENCLOSED PASSAGEWAYS SHOULD CONNECT AREAS OF EQUAL PRESSURES.



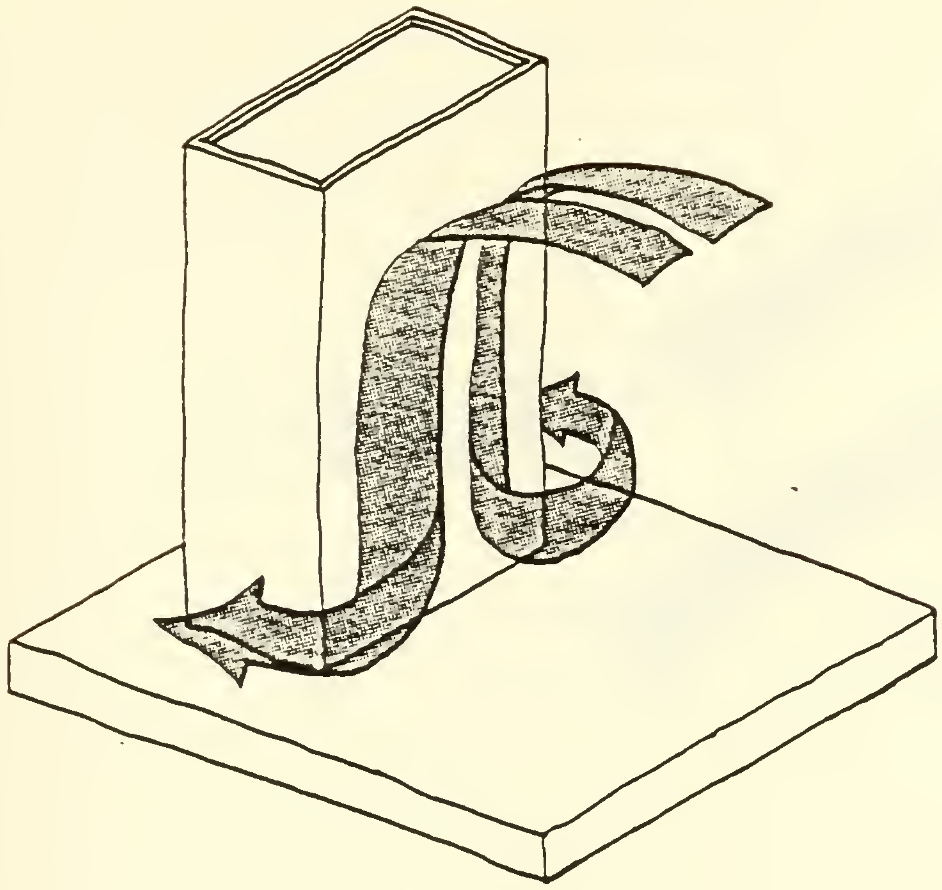
APPROXIMATELY EQUAL PRESSURES



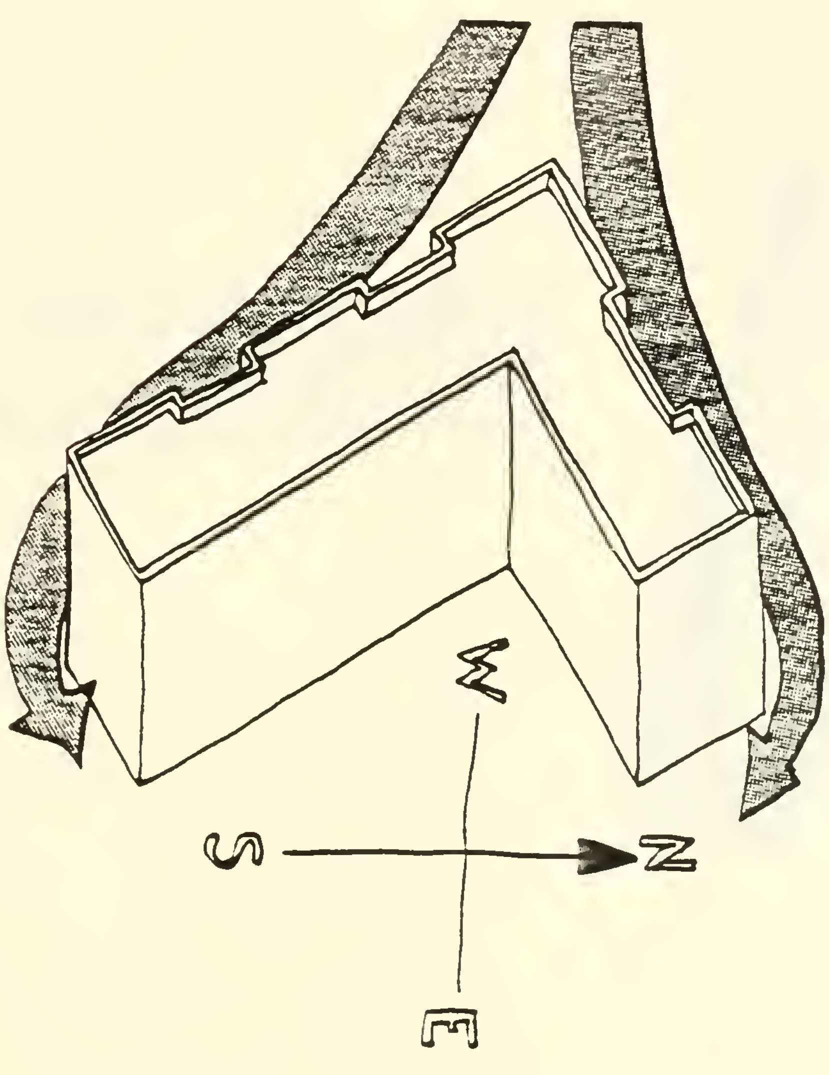
GIVE PEDESTRIANS A CHOICE OF CALM OR WINDY AREAS (BREEZES ARE WELCOME ON HOT DAYS).

APPENDIX E-3

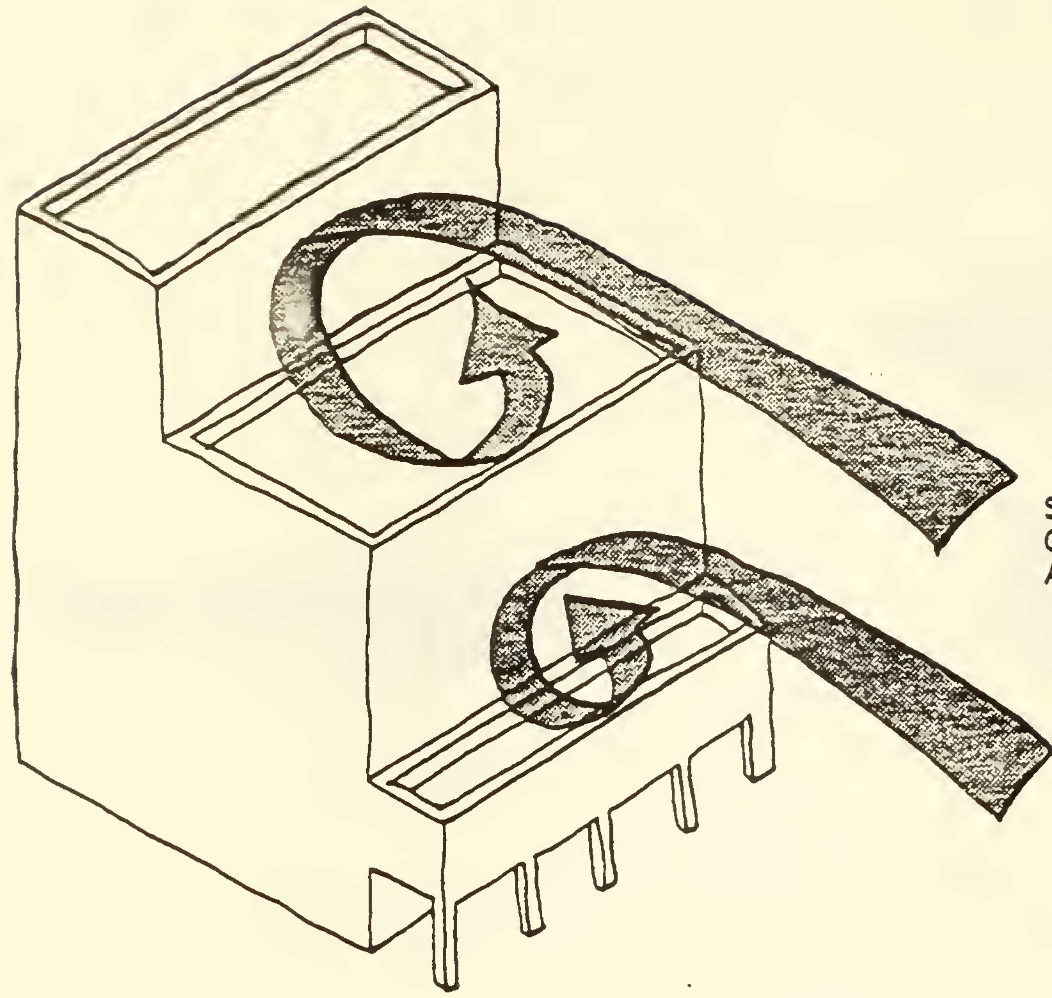
BUILDING MASS CONCEPTS FOR WIND CONTROL



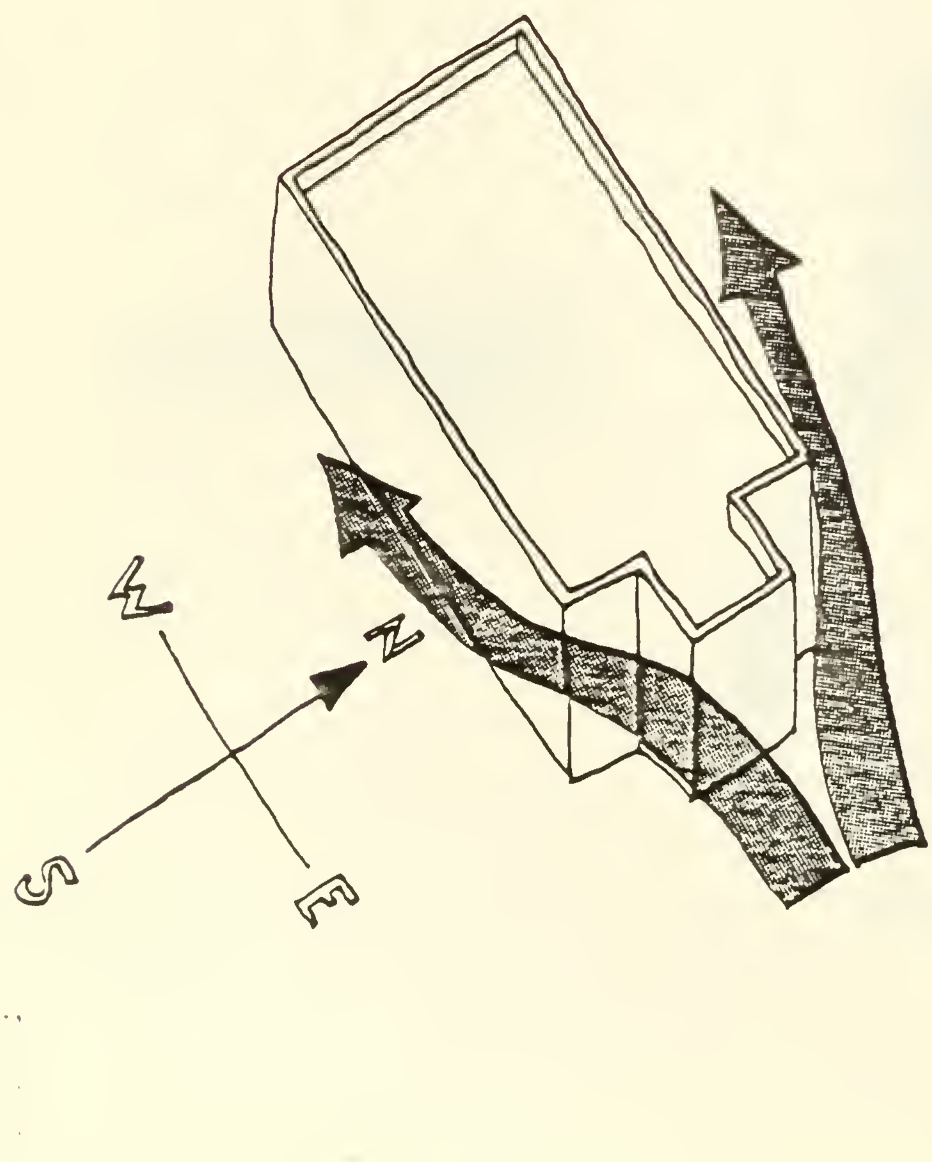
NON-PEDESTRIAN PODIUMS PROVIDE COMFORTABLE WALKWAYS AROUND TALL BUILDINGS.



BUILDINGS CAN BE USED AS WINDSCREENS BUT PEDESTRIAN AREAS SHOULD BE CAREFULLY SELECTED.



STEPPED BUILDINGS WILL GRADUALLY BREAK UP APPROACHING WIND FLOWS.



ALIGNMENT OF ELONGATED BUILDINGS WITH PREVAILING WINDS MINIMIZES IMPACT ON WIND FLOWS.
CUTTING/CHAMFERING WINDWARD BUILDING CORNERS FURTHER REDUCES IMPACT.